# TREES OF CALCUTTA

## AND ITS NEIGHBOURHOOD

# THE
# TREES OF CALCUTTA

## AND ITS NEIGHBOURHOOD

BY

A. P. BENTHALL

WITH 274 ILLUSTRATIONS

THE ASIATIC SOCIETY
CALCUTTA-16
24 DEC 1958

*CALCUTTA :*
THACKER SPINK & CO. (1933), LTD.
*LONDON :*
W. THACKER & CO.

FIRST PUBLISHED IN 1946 BY
THACKER, SPINK & CO. (1933) LTD.
Three Esplanade East, Calcutta.

PRICE TWENTY-FIVE RUPEES

3232

COPYRIGHT REGISTERED AND RESERVED

*No part or portion of the book may be reproduced without application to the publishers.*

# FOREWORD

By

DR. K. BISWAS, M.A., D.SC., (Edin)., F.R.S.E.,
*Superintendent, Royal Botanic Garden, Calcutta, in charge of duties of Director, Botanical Survey of India and Honorary Lecturer in Botany, Post Graduate Department in Science, Calcutta University.*

The study of Indian plants dates from a very early period, as early a period as 2500 B.C. In Europe herbalists probed into the mysterious uses of plants, for curing diseases and warding off evils, during the 13th and the 14th centuries, or even earlier from the time of Socrates and Plato. Various healing properties of plants are mentioned in the Vedas and other Hindu scriptures and hundreds of folklores on the religious, economic, and medicinal uses of Indian plants have had their origin from the writings and teachings of the ancient sages, herbalists, kavirajas, and pandits. These are handed down to us from generation to generation even to the present day. Some of these refer accurately to the life history and the structures of plants and their healing properties. In fact, the knowledge gained in the very early period of botanical studies through these sources has found access even into modern botanical literature and the standard pharmacopœia. Folk-lores are fascinating and create such deep impressions in the minds of laymen, as well as of trained botanists, that their treatment, in addition to a comprehensive account of morphology, systematic, taxonomy, and ecology of plants dealt with in this botanical treatise, add much to the information, delight and pleasure of readers.

Mr. Benthall, inspired by his hereditary hobby of studying plants, collected enormous information on the habitats, the ecology and the local distribution of the trees growing wild along waysides, in woodlands, and in village shrubberies during his many excursions in and outside Calcutta, and the writer of this foreword had the privilege of accompanying him from time to time. His notes assiduously made during his field studies for years are original and exhaustive and have proved to be invaluable in the treatment of the plants dealt with in his book.

It is, therefore, a treatise which is planned to assist alike students of Botany and all lovers of plants, and is indeed a useful guide to the visiting public of Calcutta and the country-side and to visitors from outside India, who are interested in the common Indian trees growing in and about Calcutta.

The book deals, as the contents show, with almost all the aspects required for getting familiar with the trees growing around us in Calcutta and its neighbourhood.

The key to the families, genera, and species are drawn up in such a manner that even non-botanists will not experience the least difficulty in spotting them. Technical terms have been avoided as far as possible and the language is lucid and attractive. Further a comparison with the accurate descriptions and the fine illustrations, which are valuable additions to the book, will avoid all possible chance of error in identifying a species. English and vernacular names, history, folk-lore, detailed notes on habitat and much other information with which this popular work is packed, are designed to suit the needs of laymen as well as of professional botanists. The book is really a treasure and fills a longstanding gap in the botanical literature on the flora of Bengal. Mr. Benthall as an amateur has thus answered the call of Sir Geoffrey Evans, the then Director, Royal Botanic Gardens, Kew, which runs as follows:—

"Let us hope that botany, and in particular systematics, will take a more leading part in the life of the Indian Universities than apparently has been the case in the past, and also that private citizens may be found who will undertake work of this kind as a matter of choice."*

It is hoped that he will make further contributions of its kind and others interested in the flora of Bengal and India will follow his good example. There are enormous materials to work out and many a virgin field yet to be explored. It is, however, regretted that there are so few among us who are genuinely interested in the floristic study of our country, which forms the backbone of all other aspects of studies on plant life. My congratulations go to Mr. Benthall in his successful attempt towards the production of such a useful treatise and I have much pleasure in placing the book before the students of botany and all lovers of plants for their study and appreciation. I am sure Mr. Benthall will welcome suggestions and healthy criticisms with a view to improving future editions.

---

* Review, entitled 'Botany in India', on the Presidential address of Dr. K. Biswas on Systematic and Taxonomic studies on the Flora of India and Burma, published in Nature, P. 581, Vol. 151, No. 3838, 1943.

The publisher also deserves our thanks for the get-up and printing of the book in such a concise form.

## *ERRATA*

Page 7. Line 29.
Page 8. ,, 28. } *Ovaria* should read *Uvaria*.
Page 79. ,, 12. *chinensis* should read *sinensis*.
Page 125. In title of plate *chinensi* should read *chinensis*.
Page 200. Line 17. *var-suffruticosa* should read *var. suffruticosa*.
Page 372. Line 30. *It leaves* should read *Its leaves*.

# CONTENTS

PAGE

**Preface** ... ... ... ... xi

**Introduction** ... ... ... ... xv

I. The Sacred Figs ; II. The Wild ; III. The Villages ; IV. The Countryside ; V. The City Streets ; VI. The Maidan ; VII. The Gardens.

**Key**

**Description of the Families, Genera, & Species**

DILLENIACEAE ... ... ... ... 1

Dillenia.

MAGNOLIACEAE ... ... ... ... 3

Magnolia ; Michelia.

ANONACEAE ... ... ... ... 7

Polyalthia ; Cananga ; Annona.

CAPPARIDACEAE ... ... ... ... 15

Crataeva.

BIXACEAE ... ... ... ... 18

Bixa ; Cochlospermum.

FLACOURTIACEAE ... ... ... ... 21

Flacourtia.

TAMARICACEAE ... ... ... ... 25

Tamarix.

HYPERICACEAE ... ... ... ... 28

Cratoxylon.

GUTTIFERAE ... ... ... ... 29

Garcinia ; Ochrocarpus ; Calophyllum.

MALVACEAE ... ... ... ... 34

Hibiscus ; Ceiba ; Salmalia ; Adansonia.

STERCULIACEAE ... ... ... ... 47

Sterculia ; Pterygota ; Erythropsis ; Heritiera ; Kleinhovia ; Pterospermum ; Guazuma ; Abroma.

TILIACEAE ... ... ... ... 64

Grewia ; Muntingia ; Berria.

OXALIDACEAE ... ... ... ... 69

Averrhoa.

PAGE

RUTACEAE ... ... ... ... 73
Murraya ; Citrus ; Feronia ; Aegle.

SIMARUBACEAE ... ... ... ... 95
Ailanthus.

OCHNACEAE ... ... ... ... 97
Ochna.

BURSERACEAE ... ... ... ... 99
Garuga.

MELIACEAE ... ... ... ... 101
Azadirachta ; Melia ; Appanamixis ; Swietenia ; Cedrela.

CELASTRACEAE ... ... ... ... 112
Elaeodendron.

RHAMNACEAE ... ... ... ... 113
Zizyphus.

SAPINDACEAE ... ... ... ... 116
Filicium ; Blighia ; Lepisanthes ; Schleichera ; Euphoria ; Litchi ; Sapindus.

ANACARDIACEAE ... ... ... ... 129
Lannea ; Spondias ; Mangifera.

MORINGACEAE ... ... ... ... 137
Moringa.

LEGUMINOSAE ... ... ... ... 140

Papilionaceae:
Sesbania ; Millettia ; Gliricidia ; Piscidia ; Pongamia ; Pterocarpus ; Dalbergia ; Erythrina ; Butea ; Brya ; Castanospermum.

Caesalpinieae:
Caesalpinia ; Peltophorum ; Delonix ; Colvillea ; Schizolobium ; Parkinsonia ; Acrocarpus ; Saraca ; Brownea ; Amherstia ; Tamarindus ; Haematoxylon ; Cassia ; Cynometra ; Bauhinea.

Mimoseae:
Adenanthera ; Leucena ; Acacia ; Vachellia ; Albizzia ; Pithecolobium ; Enterolobium.

ROSACEAE ... ... ... ... 226
Eriobotrya.

PAGE
COMBRETACEAE ... ... ... ... 228
Terminalia ; Anogeissus.
MYRTACEAE ... ... ... ... 237
Syzygium ; Psidium ; Eucalyptus ; Melaleuca ; Callistemon.
LECYTHIDACEAE ... ... ... ... 250
Barringtonia ; Careya ; Gustavia ; Couroupita.
LYTHRACEAE ... ... ... ... 259
Lagerstroemia ; Lawsonia.
SAMYDACEAE ... ... ... ... 265
Casearia.
CARICACEAE ... ... ... ... 267
Carica.
CORNACEAE ... ... ... ... 270
Alangium.
RUBIACEAE ... ... ... ... 272
Anthocephalus ; Nauclea ; Morinda ; Gardenia ; Ixora.
MYRSINACEAE ... ... ... ... 283
Ardisia ; Jacquinea.
SAPOTACEAE ... ... ... ... 286
Achras ; Mimusops ; Madhuka.
EBENACEAE ... ... ... ... 293
Diospyros.
OLEACEAE ... ... ... ... 299
Nyctanthes.
APOCYNACEAE ... ... ... ... 301
Thevetia ; Plumeria ; Ervatamia ; Holarrhena ; Alstonia ; Wrightia.
ASCLEPIADACEAE ... ... ... ... 317
Calotropis.
LOGANIACEAE ... ... ... ... 321
Strychnos.
BORAGINACEAE ... ... ... ... 323
Cordia ; Ehretia.
SOLANACEAE ... ... ... ... 327
Solanum.

PAGE

BIGNONIACEAE ... ... ... ... 330
Oroxylum ; Millingtonia ; Tecoma ; Dolichandrone ; Spathodea ; Heterophragma ; Jacaranda ; Parmentiera ; Kigelia ; Crescentia.

VERBENACEAE ... ... ... ... 349
Tectona ; Gmelina ; Vitex ; Citharexylum.

LAURACEAE ... ... ... ... 358
Litsaea ; Cinnamomum.

PROTEACEAE ... ... ... ... 364
Grevillea.

EUPHORBIACEAE ... ... ... ... 366
Euphorbia ; Jatropha ; Croton ; Trewia ; Ricinus ; Gelonium ; Sapium ; Excaecaria ; Cicca ; Emblica ; Putranjiva ; Antidesma ; Bischofia ; Aleurites.

ULMACEAE ... ... ... ... 392
Trema.

MORACEAE ... ... ... ... 394
Streblus ; Morus ; Broussonetia ; Artocarpus ; Ficus.

CASUARINACEAE ... ... ... ... 420
Casuarina.

MUSACEAE ... ... ... ... 422
Musa ; Ravenala.

PANDANACEAE ... ... ... ... 428
Pandanus.

PALMAE ... ... ... ... 430
Phoenix ; Corypha ; Livistona ; Thrinax ; Borassus ; Elaeis ; Cocos ; Attalea ; Caryota ; Arenga ; Areca ; Chrysalidocarpus ; Ptychosperma ; Roystonea ; Euterpe .

GRAMINEAE ... ... ... ... 467
Bambusa ; Dendrocalamus.

CONIFERAE ... ... ... ... 474
Araucaria ; Pinus ; Thuja ; Podocarpus.

CYCADACEAE ... ... ... ... 481
Cycas.

**List of Books Consulted** ... ... ... 485

**Index of Vernacular & English Names** ... ... 487

**Index of Botanical Names** ... ... ... 503

# PREFACE

The importance of the part played by trees in the lives of the people of Bengal scarcely needs stressing. For, apart from the many fruit-trees that provide them with food, a large number of other useful products are obtained from the many different kinds of trees to be found in the province ; and, what is probably more important to the people of Calcutta, the shade given by the trees, and the beauty that their foliage and flowers give to the otherwise dreary streets, have a great influence on the comfort and happiness of all who live in the city. The famous Maidan without its rows and clumps of handsome trees would be little more than a dismal wilderness ; and even the most squalid "basti", or the most congested industrial area, is always brightened by a few trees,—perhaps a sacred peepul at a street corner giving welcome shade, or a row of stately palms hiding the ugliness of a factory wall. In the more pleasant parts of the city the shady roads, overhung by a variety of fine trees, are a joy to every passer-by. ; and when in the month of May the branches are ablaze with flowers, those streets may perhaps be the most gorgeous in the world. To the countryman too the trees that grow about his house and village are of constant interest and of an importance second only to that of his field crops.

The names and uses of most of the common indigenous trees are fairly well-known, but nevertheless there is a great deal of confusion and misconception about some of them, and few know anything of the many scores of uncommon and exotic trees that make up a large part of the vegetation of the neighbourhood. Those who enquire about these plants are met with the difficulty that there are no comprehensive books on the subject that can be understood without some knowledge of botany, and the few learned works that do exist are all out of print, difficult to obtain, and of considerable value. This book has, therefore, been written to enable those with little or no botanical knowledge to identify the trees they may find in the Calcutta neighbourhood and to learn what is of interest about them. In the main text of the book all scientific words, not current in ordinary English, have been avoided as far as possible, only a few words have been used that are not likely to be understood by "the man in the street", and the meaning of these can be found in any dictionary. Nevertheless, without some slight knowledge of botany the subject must present a little difficulty, and interested readers are recommended to consult a simple text-book on the subject ; of these "A Manual of Indian Botany" by G. C. Bose (Blackie & Son (India) Ltd.) is an excellent example.

Although intended primarily to cover the area round about Calcutta only, it will be found that the book includes the great majority of the trees to be found in the valleys of the Ganges and Brahmaputra.

In the hope that the book may be of use as a work of reference for visiting botanists, and perhaps for students in Calcutta, a very brief description of each species in botanical language has been added to the text and printed in small type. The reading of this will be unnecessary for those who are not familiar with the terms used, because the description given in the main text should be enough to give a fair idea of the appearance of the plant, especially with the aid of the illustration provided.

Before the main text of the book a "key" will be found, which, it is hoped, will enable those with little or no knowledge of botany to identify any trees they are likely to find in the Calcutta area. It will be seen that the key is based on such obvious characteristics as the shape and size of the leaves, the colour, size, and shape of the flowers, and so on. The scientific words used in the key have been limited to the very few employed in the main text, and minute characteristics have been almost entirely avoided ; only occasionally has it been necessary to refer to such comparatively obscure characters as the number of stamens in a flower. This, however, has involved the necessity of departing almost entirely from scientific principles in the compiling of the key, and it is feared that for this reason it will occasionally be found not to work ; for owing to the unusual variations that must be expected to occur now and then in nature, any key not based on correct scientific principles must sometimes fail.

The system of classification adopted by Bentham and Hooker has been followed throughout the book in preference to more modern systems, since it is still almost invariably used in India.

Only those plants that may be called "trees" without unduly stretching the ordinary meaning of the English word have been described in this book, and no attempt has been made to include the numerous shrubs and woody climbers that are found in the area. But reference has been made to some shrubs and other plants in the descriptions of families and genera, chiefly with a view to giving information about the affinities of the trees described. The aim has been to include all the trees that may be found, both wild and planted, in Calcutta, its suburbs, and in the country round about ; but it cannot be hoped that the book is perfectly comprehensive, because an enormous number of trees are capable of growing in the climate of Bengal, and there must be many specimens of exotic trees planted in gardens and elsewhere that have escaped notice. Moreover it has of course been impossible to attempt to include all the species in the magnificent collection to be seen in the Royal Botanic Garden at Sibpur ; and a few trees believed to be found only in the Zoological Garden or in the Royal Agri-Horticultural Garden have also been omitted.

A summary of most of the available information about the economic uses of each tree has been included in the text, primarily with the idea that this will be of general interest, but also in the hope that it may help some people to make better use of the trees that grow about their homes, or may guide them when they are considering what trees to plant. As, however, the writer has no medical knowledge, only a brief indication of the reputed medicinal qualities of the many trees considered to have such attributes has been given here, and those interested in this subject are referred to one of the standard books on Indian medicinal plants.

An introduction has been added containing a review of the whole scope of the book based on a division of the area into the principal habitats and situations of the trees described. This, it is feared, is of little or no scientific value, if for no other reason than that the plants dealt with are chosen only because of their arboreous habit ; but it is hoped that it will be of interest to those who want to study the trees of the area, and even to those who have only a cursory interest in the plants they see around them.

In the description of each species reference has been made to Roxburgh's "Flora Indica" (Clarke's single volume edition, 1874), Sir J. D. Hooker's "Flora of British India", and Sir D. Prain's "Bengal Plants".

The author is glad to be able to record his deep gratitude to Dr. K. Biswas, the Superintendent of the Royal Botanic Garden, Calcutta, for much valuable advice and encouragement, without which this book could scarcely have been written ; and to Dr. S. K. Mukerjee, the Curator of the Herbarium, and his staff, who have very kindly given much help in identifying specimens and in revising nomenclatures. Mr. V. Narayanaswami has corrected the names of the species described, and has provided some extremely valuable notes on the mythological and religious beliefs connected with certain trees. Special thanks are also due to Mr. S. Percy-Lancaster, the Secretary of the Royal Agri-Horticultural Society of India, whose great knowledge of Indian plants and gardens has been at the author's disposal, and who in fact has taught him much of what he has been able to learn about the trees of Bengal. Mr. Lancaster has added to the debt by kindly reading through the manuscripts and making a number of suggestions and corrections.

Acknowledgement is made to the many books that have been consulted, a list of which is given at the end of the text.

> TO THE WAYFARER—
>
> Ye who pass by and would raise your hand against me, hearken ere you harm me.
>
> I am the heat of your hearth on the cold winter nights, the friendly shade shielding you from the summer sun, and my fruits are refreshing draughts quenching your thirst as you journey on.
>
> I am the beam that holds your house, the board of your table, the bed on which you lie, and the timber that builds your boat.
>
> I am the handle of your hoe, the door of your homestead, the wood of your cradle and the shell of your coffin.
>
> Ye who pass by, listen to my prayer and harm me not.
>
> Notice seen in Portugal in woodlands and parks.
>
> Quoted by KAMTA PRASAD SAGREIYA in *Ornamental Trees : Their Planting and Care.*

# INTRODUCTION

## I. THE SACRED FIGS.

On the plains of Bengal, whether it be in a country thicket, or in the midst of a village, or on the borders of a wide thoroughfare, or even in the centre of the city of Calcutta, two trees tend to dominate all others and to thrust themselves on the attention of any observer. These are the peepul[1] and the banyan,[2] the two sacred fig-trees of the Hindus, which are not only wonderfully adapted by nature for propagating themselves in situations where few other plants can obtain a foothold, but are protected and often planted by man, and for religious reasons are seldom destroyed, however much damage they may do.

These two plants often begin life as epiphytes, that is to say their seeds germinate in places where the young plants are supported by other trees or by buildings, and grow without the presence of soil by means of the nourishment they are able to obtain from the air and the rain. The peepul usually starts its career where a seed has been dropped by a bird in a crack of some wall or building, or perhaps on the trunk of a tree, and the seedling then drives its roots into the interstices of the masonry, or of the branches and roots of its host, until the building collapses or the tree is smothered by the invader. The banyan less often damages buildings but more frequently attacks other trees and not uncommonly begins life in the base of one of the leaves of a palm, whence it spreads and sends down roots to the ground, until eventually it entirely replaces the palm on which it at first relied for support.

Both these trees are venerated by the Hindus and are often planted for religious reasons near houses and temples and in villages. Beneath their branches may be seen little shrines marked by the presence of rounded stones, and sometimes small temples are erected in their shade. Wherever Hindus live these two trees abound, and however much damage to walls and buildings and other trees may be done by them, a Hindu will seldom or never do anything to check their growth. To Moslems, it is true, they have no special attraction,—perhaps rather the reverse,—but no dweller in India can fail to bless them for the welcome shade they give in streets and highways, and in fact wherever trees can grow. Both trees too, though so common that they seldom evoke admiration, have great beauty of form and colour, and without them the plains of Bengal would be a dreary land. Sit beneath the spreading branches of a peepul on a sunny day in the hot weather, and look, and listen. The innumerable shining leaves tremble in the breeze on their long slender stalks, each blade flashing and shimmering as the light strikes its darker and paler surfaces in turn ; the twigs are thronged with many kinds of birds feasting on the ripening figs, and their happy voices mingle with the sound of the hard pointed tails of the leaves striking against their polished blades and rustling like a distant shower of rain ; if there is a pond beneath the tree, shoals of little fishes will jostle one another for the figs dropped by the birds above ; all seems the quintessence of happiness, plenty, beauty, and animation. The banyan has a more sombre look, but the numerous aerial roots that cause many an old tree to form a little forest of its own, give it a uniquely venerable air and make it quite the best known of Indian trees. Of these Calcutta boasts one of the largest in the world, the great banyan in the Royal Botanic Garden, and several other giants may be seen about the city, as well as countless examples, of great age but more moderate size, that line the roads and streets of Bengal. In the spring, for short periods differing greatly in the case of each individual tree, both the peepul and the banyan are gay with new leaves, which vary from bright emerald to pink and copper-colour ; at these times few trees can surpass them for beauty of foliage.

---

[1] *Ficus religiosa.* Linn. (*Asvattha*).

[2] *Ficus bengalensis* Linn. (*Bot*).

Wherever one looks in Bengal the two sacred figs must attract attention before almost any other trees, and they have, therefore, been mentioned at the beginning of this survey. We will now pass on to consider the trees of Calcutta and the country round about according to the principal situations in which they are found.

## II. The Wild.

Not much more than a hundred years ago the wild rhinoceros roamed near Alipore and panthers were often hunted in what is now part of the city of Calcutta. In those days jungle must have stretched from the Sunderbans to the edge of the city, but to-day there is no real forest within the districts of Hooghly, Howrah, and the 24-Perganas, except where, in the far south, the Sunderbans flank the Bay of Bengal. Around Calcutta the country consists of treeless swamp and lake, and broad expanses of paddy-fields, interspersed with roads and paths and villages, which are for the most part planted with various trees that are of economic use to the teeming population. In such country, waste land suitable for the growth of trees and shrubs is scarce, but here and there patches may be found which for some reason or other are neither cultivated nor planted with useful trees, and in such places the natural vegetation of the region may be studied.

If a plot of cultivated land is no longer tilled, the grazing and trampling of cattle and goats usually prevents the growth of any vegetation except grasses and the other plants that make up turf, and the ground tends to remain as pastureland. If the trampling is not too severe, a number of coarse weeds will begin to invade the turf and a variety of thorny shrubs and other plants not attractive to grazing animals will slowly advance, their seedlings sheltered by the weeds until large enough to escape the trampling. Eventually a thicket of small trees and shrubs will appear, of which, the commonest constituents will probably be the thorny *ber*[1] and *benchi*,[2] and the *mom china*,[3] which is full of an acrid, milky sap unpalatable to animals. In the course of time other trees and shrubs, more liable to attack by beasts, will grow up in the shelter of the first arrivals, until in the end a wood will be produced not unlike the original virgin forest that must have covered the land before man became dominant.

If the cultivated land or pasture, when first neglected, is not accessible to grazing animals, a rather different sequence of events takes place. In that case the plants that will have the advantage in the struggle for existence will be those whose seeds are best adapted for rapidly colonising the available ground and whose growth is sufficiently tall and rapid to win the race for sunlight and so to overcome their rivals which may be slower off the mark or less vigorous in growth. Many plants will join in the race, but the winners are likely to be mostly the *jilan* or *chikun*,[4] and the *ber*, which rely chiefly on birds to disperse their seeds, together with the *akanda*[5] and the *simal*,[6] the seeds of which are provided with silky floss that enables them to be carried far and wide by the wind. Wherever there is an old wall, or the stump of a fallen tree, or anything to give them support, the peepul[7] and the banyan[8] will probably appear, and their near relative the *dumar,*[9] a quick-growing, shrubby plant with coarse hairy leaves, will also arrive early on the scene. These plants and others soon cover the ground with scrub, and in the course of time slower growing but more permanent species will spring up in their shelter, until ultimately, if man does not interfere, the land will return to something very like true forest.

---

[1] *Zizyphus* spec.

[2] *Flacourtia indica* (Burm. f.) Merr.

[3] *Sapium sebiferum* Roxb.

[4] *Trema orientalis* Bl.

[5] *Calotropis gigantea* R. Br. This plant is very common on roadsides and in waste places, where it is usually found flowering as a shrub. It is not edible by animals but is easily damaged by trampling when young and by the wind when old. In thickets it does not compete well with other shrubs and trees.

[6] *Salmalia malabarica* Schott. et Endl. (The silk-cotton tree).

Such places near Calcutta are few and very limited in area, but where they occur the trees and shrubs that make up their vegetation are always much the same. Above all other trees a few lofty palmyras[10] will probably raise their crowns of greyish-green, fan-shaped leaves. At a rather lower elevation come the tops of the mangoes[11] and tamarinds,[12] which make up the main mass of the foliage at higher levels ; among them the lighter green of a neem can probably be seen, and in the cold season the naked branches of a *simal* (later to bear huge crimson flowers), or the spreading crown of a siris[13] covered with yellowish pods, will stand out conspicuously from the green around them. The ubiquitous banyan and peepul are sure to be found, and at a height rather below that of the tallest trees the dark, evergreen foliage of the *chalta,*[14] and of the *dephal* or *lakucha,*[15] will be seen here and there, the former bearing large white flowers and green fruits during the monsoon, and the latter orange lumps of male flowers in the spring and shapeless yellowish fruits in the rains. At a lower level still, in the gaps between the larger trees and round the edges of the wood, small trees and shrubs in great variety form dense thickets ; of these perhaps the commonest are the *pitali*[16] and the *jilan* or *chikun,* two unattractive but abundant trees, and the *bel,*[17] conspicuous owing to its large, round, woody fruits. Occasionally in the hot season the beautiful, pendulous, yellow flower-sprays of the *amaltas*[18] may be found, but unfortunately these trees are usually deformed and stunted owing to the depredations of men in search of their medicinal pods and bark. The *ber* and the *benchi* make up thorny tangles among which the dark evergreen foliage of the *tikta raj*,[19] the *ban naranga*,[20] and the *shiora*[21] show up conspicuously, while in more open places the *babul*[22] and the wild date palm[23] are likely to be dominant. The latter would grow to a great height were it not for the activities of toddy-gatherers, who repeatedly cut large notches in its trunk in order to tap the sweet sap, and so make the tree a stunted and deformed object, albeit one of the most typical of the Bengal countryside.

---

[7] *Ficus religiosa* Linn. (*Asvattha*).

[8] *Ficus bengalensis* Linn. (*Bot*).

[9] *Ficus hispida* Linn. f.

[10] *Borassus flabellifer* Linn. (*Tal*).

[11] *Mangifera indica* Linn. (*Am*).

[12] *Tamarindus indica* Linn. (*Tentul*).

[13] *Albizzia Lebbek* Bth. (*Sirissa*).

[14] *Dillenia indica* Linn.

[15] *Artocarpus Lakoocha* Roxb.

[16] *Trewia nudiflora* Linn.

[17] *Aegle Marmelos* Corr.

[18] *Cassia Fistula* Linn.

The following will be found to be a fairly complete list of all trees now established as if wild in the neighbourhood of Calcutta; all are considered to be truly indigenous unless otherwise stated:—

*Dillenia indica* Linn. (*Chalta*). Spontaneous, and planted near villages for its fruits; not indigenous but a native of the Himalayas and Assam.

*Polyalthia cerasoides* Bth. and Hk. Occasional in village shrubberies; a native of the dryer parts of India.

*Polyalthia suberosa* Bth. and Hk. (*Bara chati*). Not uncommon in thickets and about villages.

*Flacourtia indica* (Burm. f.) Merr. (*Benchi*). Abundant in thickets and hedges.

*Tamarix gallica* Linn. (*Ban jhau*). Occasional on the edges of streams and marshes.

*Hibiscus tiliaceus* Linn. (*Bola*). In gardens and occasionally on the banks of the Hooghly; a plant of brackish river-banks.

*Salmalia malabarica* Schott. et Endl. (*Simal*). Common everywhere.

*Guazuma tomentosa* Kunth. (*Nipal tunth*). Planted and self-sown everywhere, common; a native of tropical America.

*Abroma augusta* Linn. (*Ulat kambal*). Occasional in villages and thickets; a native of Malaya.

*Grewia glabra* Bl. (*Kath bimla*). Occasional in shrubberies south and west of Calcutta.

*Feronia Elephantum* Correa. (*Kath bel*). Occasional about villages and also self-sown ; not very common ; native in the dryer parts of India.

---

[19] *Appanamixis polystachya* (Wall.) R. N. Parker.
[20] *Gelonium multiflorum* A. Juss.
[21] *Streblus asper* Lour.
[22] *Acacia arabica* Willd.
[23] *Phoenix sylvestris* Roxb. (*Khajür*).

*Aegle Marmelos* Correa. (*Bel*). Planted and self-sown everywhere ; truly native in the dryer parts of India.

*Azadirachta indica* A. Juss. (*Nim*). Common everywhere, especially in towns and gardens.

*Appanamixis polystachya* (Wall.) R. N. Parker. (*Tikta raj*). Common in thickets and often planted ; indigenous in hilly parts of India.

*Cedrela Toona* Roxb. (*Tun*). Occasionally planted and also self-sown, but not common ; indigenous in most of the low hills of India.

*Zizyphus Jujuba* Linn. (*Ber*). Common everywhere, wild and planted.

*Lannea grandis* (Dennst.) Engl. (*Jiyal*). Abundantly planted in villages, mostly to mark boundaries ; also found in thickets.

*Mangifera indica* Linn. (*Am*). The mango. Planted and also self-sown ; very common in villages ; native in India but not in lower Bengal.

*Spondias mangifera* Willd. (*Amra*). Very common about villages, planted and self-sown ; indigenous in most parts of India but not considered so in lower Bengal.

*Moringa oleifera* Lamk. (*Sajina*). Very common about villages, usually planted but occasionally self-sown.

*Pongamia pinnata* (L.) Merr. (*Karanja*). Frequent on the banks of rivers, streams, and tanks.

*Tamarindus indica* Linn. (*Tentul*). Common ; originally a native of Africa.

*Cassia Fistula* Linn. (*Amaltas*). Common in gardens and not uncommon in thickets ; native in most parts of India but not considered truly indigenous in lower Bengal.

*Bauhinea purpurea* Linn. (*Deva kanchan*). Common in gardens and about villages, and well established here and there in thickets ; indigenous in hilly parts of India.

*Leucaena glauca* Benth. Common in hedges and thickets, on riverbanks, and about villages ; a native of America.

*Acacia arabica* Willd. (*Babul*). Very common in fields and waste places and on roadsides.

*Acacia Suma* Ham. (*Sau kanta*). Occasional in thickets and shrubberies.

*Albizzia Lebbek* Benth. (*Sirissa*). The siris. Planted in villages and sometimes self-sown ; a native of the lower slopes of the Himalayas ; common.

*Albizzia procera* Benth. (*Koroi*). Occasionally planted and naturalised about villages ; a native of the dryer parts of India.

*Albizzia lucida* Benth. (*Sil koroi*). Planted and also occasionally self-sown, but uncommon.

*Pithecolobium dulce* Benth. (*Belati amli*). Fairly common about villages and often used as a hedge-plant ; a native of America.

*Enterolobium Saman* Prain. (*Belati sirissa*). The rain tree. Much planted on roadsides and now becoming naturalised ; a native of America imported into India late in the 19th century.

*Syzygium Cumini* (L.) Skeels. (*Kala jamb*). Commonly planted and sometimes self-sown about villages ; indigenous in most of the damper parts of India and probably in lower Bengal.

*Barringtonia acutangula* Gaertn. (*Hidjal*). Spontaneous on river banks and occasionally planted on roadsides.

*Alangium salvifolium* (L. f.) Wangerin. (*Ankura*). Occasional about villages.

*Anthocephalus indicus* A. Rich. (*Kadam*). Frequently planted and occasionally spontaneous.

*Morinda citrifolia* Linn. (*Ach*). Occasional near the banks of the Hooghly below Calcutta ; a maritime plant.

*Ardisia solanacea* Roxb. (*Ban jam*). Not uncommon in thickets and about villages.

*Diospyros cordifolia* Roxb. (*Ban gab*). Occasional in thickets and about villages ; scarce.

*Diospyros peregrina* Gurke. (*Gab*). Occasional about villages and in thickets ; also planted on roadsides, but not very common.

*Thevetia peruviana* (Pers.) Merr. (*Kokla phul*). Very common in gardens and naturalised here and there ; a native of South America.

*Calotropis gigantea* R. Br. (*Akanda*). Very common on roadsides and in waste places.

*Cordia dichotoma Forst.* (*Bohnari*). Occasional in thickets and about villages ; sometimes planted.

*Solanum verbascifolium* Linn. (*Arasa*). Fairly common on roadsides and in waste places.

*Oroxylum indicum* Vent. Planted and also spontaneous, but not common ; a native of most of the damper parts of India but not considered indigenous in lower Bengal.

*Vitex Negundo* Linn. (*Sanbhalu*). Fairly common in hedges and about villages.

*Vitex trifolia* Linn. (*Pani sanbhaki*). Occasional in hedges and about villages ; scarce.

*Litsaea chinensis* Lamk. (*Kukur chita*). Fairly common in thickets and about villages.

*Litsaea monopetala* (Roxb.) Narayanaswami. (*Bara kukur chita*). Not uncommon in thickets and about villages.

*Putranjiva Roxburghii* Wall. (*Jia pata*). Very commonly planted on roadsides and sometimes spontaneous ; a native of damp evergreen forests in many parts of India, but not considered indigenous in lower Bengal.

*Antidesma Ghaesembilla* Gaertn. (*Khudi jamb*). In hedges and thickets, occasional.

*Jatropha Curcas* Linn. (*Bagh bherenda*). Very common as a hedge plant and sometimes spontaneous ; a native of America naturalised in many parts of India.

*Croton oblongifolius* Roxb. (*Chuka*). Occasional in thickets and about villages ; not common.

*Trewia nudiflora* Linn. (*Pitali*). Very common everywhere, especially on the banks of rivers, streams, and tanks.

*Gelonium multiflorum* A. Juss. (*Ban naranga*). Very common in thickets and sometimes planted in gardens.

*Sapium sebiferum* Roxb. (*Mom china*). Very common in thickets and waste places.

*Excaecaria Agallocha* Linn. (*Gengwa*). A plant of salt marshes, common in the Sunderbans and occasionally found on the edges of the Salt Lakes and on the banks of the Hooghly below Budge Budge.

*Trema orientalis* Bl. (*Jilan* or *chikun*). Very common.

*Streblus asper* Lour. (*Shiora*). Very common.

*Artocarpus Lakoocha* Roxb. (*Dephal*). Often planted and fairly commonly self-sown ; a native of evergreen forests in many parts of India but not truly indigenous in lower Bengal.

*Ficus infectoria* Roxb. (*Pakur*). Not uncommon about villages.

*Ficus Rumphii* Bl. (*Gaiasvattha*). Occasional, especially near water.

*Ficus religiosa* Linn. (*Asvattha* or *pipal*). Abundant everywhere.

*Ficus bengalensis* Linn. (*Bot*). Very common everywhere but not truly indigenous except in the foothills of the Himalayas and in evergreen forests of the west of India.

*Ficus hispida* Linn. f. (*Dumar*). Very common in hedges and thickets.

*Ficus glomerata* Roxb. (*Jagya dumar*). Not uncommon about villages and on roadsides.

*Pandanus tectorius* Soland. (*Keiya*). Wild in the Sunderbans; occasionally planted near Calcutta and naturalised here and there in thickets.

*Phoenix sylvestris* Roxb. (*Khajur*). Commonly planted and also spontaneous; a native of the Punjab.

*Borassus flabellifer* Linn. (*Tal*). Fairly common everywhere but nowhere abundant; spontaneous, but not considered indigenous in lower Bengal.

Of the above 69 trees that may be considered naturalised in the neighbourhood of Calcutta, 41 are thought to be truly indigenous, 20 are natives of other parts of India, 6 originated in America, and 1 each in Africa and Malaya. A number of others show signs of becoming established and another review made at the end of the present century will probably show many additions to the list. On the other hand several plants, which seem to have been fairly common fifty years ago, are now scarce or altogether missing, e.g. *Croton Tiglium* Linn. (Bengali, *jaipal*), which is considered indigenous in lower Bengal and was once much grown for the purgative oil obtained from its seeds but is now scarcely to be found in the area round Calcutta.

## III. THE VILLAGES

A stranger approaching through the surrounding expanse of paddy-fields a typical Bengal village would probably take it from a little distance to be no more than a wood or a grove of trees and would be surprised on entering it to find how great a number of huts, and houses, and tanks, and small enclosed plots of vegetables, were concealed among the dense foliage around and above them. A wide variety of shrubby and arboreous plants grows in such places, and in fact almost every shrub and tree naturalised in Bengal can be found there, but the great majority of the plants grown by the villagers must of necessity serve a useful purpose and help to alleviate their hard lot. For this reason nearly all the trees in a typical village will be found to yield edible fruits, or building material, or something else of value to the teeming population. A few of the less valuable (but very easily propagated) wild trees will be used to form hedges, but most of the indigenous and comparatively useless plants will be confined to an occasional neglected thicket, which for some reason or other has not been cared for and planted with useful species as has the greater part of the land.

Towering above all other trees, the feathery crowns of the coconut palms[1] are usually raised above the houses and huts of the villagers ; they are grown chiefly for the green coconuts, which are collected for the sake of their refreshing juice. Rather lower the dense and gloomy evergreen foliage of the mangoes[2] and the jack-fruit trees[3] form a background of sombre colour ; the former are seldom of good varieties and generally yield only the common "jungly" fruits that are usually picked when green and used for culinary purposes only ; the latter yield their enormous fruits in large quantities and form a substantial source of food for the people. Here and there, but seldom near houses because of a general belief that its presence is unhealthy, a jade-green tamarind[4] is grown for its pods, which yield an acid-tasting pulp much valued for flavouring purposes. At a lower level still many kinds of fruit-trees grow. Conspicuous because of their size and dark, evergreen foliage are the *chalta*,[5] the *sapota*,[6] the *dephal* or monkey-jack,[7] and the *asphal* or longan[8] ; the latter is much more common than the quality of its small fruits, like very inferior litchis, would seem to warrant, and its popularity may be partly due to the excellent shade that its spreading branches yield. The *bel*[9] has sparser foliage but its large, round, woody fruits are very noticeable, and always welcome to the villagers for their medicinal qualities. The bullock's heart or *non ata*[10] is abundant everywhere, but its near relative the custard apple[11] is rather less common though its fruits are much superior. The guava[12] too is very common and yields excellent fruits throughout the rains and into the cold season. The *amra* or hog plum[13] is another abundant plant and is conspicuous both in the spring when its yellowish flowers appear at the ends of the bare branches, and when its large fruits hang on the tree after the leaves have fallen at the end of the rains ; it is grown to form hedges as well as for its fruits. The *jamrul*[14] and the *golab jamb*[15] are common, especially the former, and both are small, spreading, evergreen trees that give welcome shade as well as refreshing, waxy fruits. The *kala jamb*[16] is also plentiful but is a much taller tree ; it is valued for its blackish, plum-like fruits and, being venerated by the Hindus, is sometimes planted near temples. Bananas[17] are abundantly planted but most of them are one of the varieties that yield fruits only suitable for cooking. The papaya[18] grows to perfection in Bengal but, in spite of its rapid growth and ease of cultivation, is not as common in villages as might be expected and is mostly seen in the gardens of the more well-to-do inhabitants. The pumelo[19] and the sour lime[20] also produce excellent fruits but are not commonly seen on land tended by the poorer people, possibly because their growth is slow and the poor man needs quick returns for his labour ; the citron[21] and the lemon[22] are also grown occasionally but the various oranges and other useful fruits of the genus *Citrus* that flourish in the dryer parts of India, do not succeed in Bengal. In some villages, especially those to the south of Calcutta, graceful betel-nut palms[23] grow in stately rows, planted close enough to allow a gatherer of the nuts to pass from one tree to another without descending from their lofty summits ; these palms do not flourish very far from the sea-shore, but they do well as far north as Calcutta. Occasionally too a few palmyras[24] may be seen within the confines of a village, though they are more often found in fields outside ; they are valued for their fruits and for many other useful products that they yield.

---

[1] *Cocos nucifera* Linn. (*Narikel*).
[2] *Mangifera indica* Linn. (*Am*).
[3] *Artocarpus integra* (Thunb.) Merr. (*Kathal*).
[4] *Tamarindus indica* Linn. (*Tentul*).
[5] *Dillenia indica* Linn.
[6] *Achras Zapota* Linn.
[7] *Artocarpus Lakoocha* Roxb.
[8] *Euphoria Longana* Lam.
[9] *Aegle Marmelos* Corr.

---

[10] *Annona reticulata* Linn.
[11] *Annona squamosa* Linn. (*Ata*).
[12] *Psidium Guayava* Linn. (*Piyara*).
[13] *Spondias mangifera* Willd.
[14] *Syzygium samarangense* (Bl.) Merr. & Perr.
[15] *Syzygium Jambos* (L.) Alston.
[16] *Syzygium Cumini* (L.) Skeels.
[17] *Musa paradisiaca* Linn. (*Kela*).
[18] *Carica Papaya* Linn. (*Pepe*).
[19] *Citrus grandis* Osbeck. (*Batavi nebu*).
[20] *C. aurantifolia* Swingle. (*Pati nebu.*)
[21] *C. medica* Linn. (*Beg pura*).
[22] *C. Limon* Burm. (*Karna nebu*).
[23] *Areca Catechu* Linn. (*Supari*).

In addition to the trees mentioned above the following are also grown round about Calcutta for their edible fruits, though some are seldom seen in villages and are more or less confined to the gardens of the wealthier people or cultivated in special orchards:—

*Flacourtia Jangomas* Raeusch. (*Paniala*). Occasionally seen in gardens and villages.

*Grewia asiatica* Linn. (*Phalsa*). Common.

*Averrhoa Carambola* Linn. (*Kamaranga*). Fairly common.

*Averrhoa Bilimbi* Linn. (*Bilimbi*). Fairly common.

*Feronia Limonia* (L.) Swingle. (*Kath bel*). Fairly common.

*Zizyphus Jujuba* Linn. (*Ber*). Very common, but mostly the self-sown wild variety. Superior varieties are sometimes grown, and *Z. vulgaris* Lamk. (*Titni ber*) may also be found.

*Blighia sapida* Koen. Rare.

*Litchi chinensis* Sonner. (*Litchi*). Common in gardens but rare in villages.

*Spondias dulcis* Forst. f. (*Bilati amra*). Scarce.

*Moringa oleifera* Lamk. (*Sajina*). Abundant in villages ; used for fencing and for various other purposes as well as for its slender edible pods.

*Eriobotrya japonica* Lindl. The loquat. Very scarce.

*Terminalia Catappa* Linn. (*Deshi badam*). Often planted on roadsides ; grown more for shade than for its edible nuts, which are difficult to preserve from parrots.

*Syzygium malaccense* (L.) Merr. & Perr. (*Malacca jamrul*). Scarce.

*Alangium salvifolium* (L. f.) Wangerin. (*Ankura*). Fairly common in villages though the fruit is very poor.

*Anthocephalus indicus* A. Rich. (*Kadam*). Fairly common ; grown more for ornament and for its religious associations than for its fruits.

*Morinda citrifolia* Linn. (*Ach*). Rather scarce.

---

[24] *Borassus flabellifer* Linn. (*Tal*).

*Mimusops Elengi* Linn. (*Bakul*). Common; generally planted on roadsides and in gardens for shade; the fruits are very poor.

*Diospyros peregrina* Gurke. (*Gab*). Fairly common; the fruits are edible but are chiefly valued for caulking boats.

*Diospyros discolor* Willd. In gardens and villages occasionally; the fruits are very mawkish.

*Cordia dichotoma* Forst. (*Bohari*). Fairly common in villages and thickets.

*Phyllanthus distichus* Muell.-Arg. (*Noari*). Fairly common.

*Emblica officinalis* Gaertn. (*Amla*). Scarce.

*Morus alba* Linn. (*Tunt*). The white mulberry. Not uncommon in gardens; scarce in villages.

*Ficus hispida* Linn. f. (*Dumar*). Abundant everywhere; the young figs are collected for cooking in curries.

*Ficus auriculata* Lour. Probably only in a few gardens; grown chiefly for ornament.

*Ficus glomerata* Roxb. (*Jagya dumar*). Fairly common; the figs are very inferior but are eaten both raw and cooked.

Here and there in most villages, especially in the gardens round the houses of the more well-to-do inhabitants, a few trees may be seen which have been planted entirely for the beauty of their flowers; of these the commonest are perhaps the frangipanis,[25] with their scented flowers of various colours, the *tagur* or *chandni*[26] with small white flowers, and the *kokla phul*[27] with yellow or pinkish flowers of a funnel-like shape. Other trees are grown partly because of their beauty and partly for their religious significance, and of these the yellow flowered *champa*[28] is perhaps the most notable. About the houses of the Hindus the neem[29] is commonly planted and is nearly always welcome when its seedlings appear self-sown, because of the great medicinal virtues attributed to the tree as well as its religious associations. Near temples and Hindu dwellings the curious *mansasij*[30] may sometimes be seen with its soft stems and rough bark. Finally the two sacred figs, the peepul[31] and the banyan,[32] must again be mentioned, for it is difficult to imagine a Bengal village without them, and beneath their spreading limbs much of the life of the village is carried on,—the games of the children, the evening deliberations of their elders, and the devotions of the pious Hindus.

---

[25] *Plumeria* spec. (*Gorur champa*).
[26] *Ervatamia divaricata* (L.) Burkill.
[27] *Thevetia peruviana* (Pers.) Merr.
[28] *Michelia Champaca* Linn.
[29] *Azadirachta indica* A. Juss.
[30] *Euphorbia neriifolia* Linn.

Before leaving the village we must consider the trees that are used to form the many hedges needed to separate the various small plots that surround the houses of the inhabitants and to border the roads and paths. Such hedges are of two main kinds, the low prickly hedge made of thorny plants, and the tall hedge consisting of the trunks or stems of fairly lofty trees between which smaller plants are grown to fill up the gaps. The first type of hedge may be made of many different kinds of thorny shrubs and creepers, but some of the plants used are capable of developing into trees, notably the Madras thorn or *belati amli*,[33] the *bajvaran*,[34] and the *sij*,[35] the last two being near relatives of the sacred *mansasij*, which is mentioned above. The principal quality needed in a plant suitable for forming a tall hedge is an ability to grow quickly from cuttings thrust into the moist ground during the monsoon; the following five plants are often used in this way:—

*Lannea grandis* (Dennst.) Eng. (*Jiyal*). Probably the plant most commonly used for hedging purposes, but of little use in other respects.

*Spondias mangifera* Willd. (*Amra*). Very like the *jiyal* in appearance; less commonly used for hedging but valued for its fruits and often planted as a fruit-tree; also self-sown.

*Moringa oleifera* Lamk. (*Sajina*). Very common everywhere; the pods, flowers, leaves, twigs, and roots are all eaten and various other useful products are obtained from the plant.

*Erythrina indica* Lamk. (*Palita mandar*). Sometimes used for hedges but more often as a support for the betel vine and other vegetables; bears handsome red flowers on the leafless branches in spring.

---

[31] *Ficus religiosa* Linn. (*Asvattha*).
[32] *Ficus bengalensis* Linn. (*Bot*).
[33] *Pithecolobium dulce* Benth.
[34] *Euphorbia Antiquorum* Linn.
[35] *Euphorbia Nivulia* Ham.

*Jatropha Curcas* Linn. (*Bagh bherenda*). Very common and very suitable for hedging because the leaves are not eaten by goats or cattle ; valued for its medicinal qualities.

One other important form of vegetation remains to be considered before we emerge into the open country. In lower Bengal bamboos are of the greatest importance for all kinds of building purposes in villages, for scaffolding in towns, and for fencing and mat-making everywhere ; moreover in the last twenty years a great demand for bamboos has developed from Indian paper mills, and those in Calcutta alone require over 80,000 tons of this material annually. These enormous requirements are very largely met by the bamboos grown in clumps and plantations attached to villages, for no bamboo is indigenous in the area and none grows without being planted and tended by man. Every village has a few clumps to supply its own requirements and some have quite large spaces almost entirely devoted to bamboo cultivation. Two species, the *tulda*[36] and the *bhalkua*,[37] are commonly grown for building, of which the former is the more abundant but the latter is considered superior for most purposes. A third species, the *basini bans*,[38] is less frequently grown ; its stems have much thinner walls than those of the two commoner kinds and are mostly used for making mats and baskets. Several other kinds are also grown occasionally for use or for ornament.

## IV. THE COUNTRYSIDE

On emerging from a village a wide expanse of open paddy-fields may often be seen extending for a mile or more, till the next village appears like a distant forest on the horizon ; but more often the country is scattered here and there with trees or shrubs, forming hedges round plots of vegetables, irregular lines along the paths and tracks that connect neighbouring villages, and occasionally small clumps marking the position of swamps or patches of ground that for some reason are not used for cultivation. In these situations any of the indigenous and naturalised plants may be found, but everywhere hungry cattle and goats are constantly seeking food, and for this reason the commonest trees in open spaces must be those which are not liable to damage by grazing when they are young. So it is not surprising to find the thorny

---

[36] *Bambusa Tulda* Roxb.
[37] *Bambusa Balcooa* Roxb.
[38] *Bambusa vulgaris* Schrader.

*babul,*[1] the most abundant tree in such places, and the almost equally thorny *ber*[2] and *benchi*[3] its frequent companions. Along roadsides the *akanda*[4] is a common plant, usually growing, and producing its mauve or white flowers, as a low shrub, although in sheltered nooks it can develop into a small tree ; it is not protected by thorns but the milky juice contained in its large greyish leaves makes it quite uneatable by animals.

The tree or shrubs just mentioned, being low and rather inconspicuous, cannot be said to form a striking part of the scenery, and the most characteristic features of the landscape are undoubtedly the palms, which can be seen wherever trees are to be found. The commonest of these in the open country is the wild date palm,[5] which raises its mutilated trunk crowned by a dense cluster of spinous leaves on most roadsides and in waste places everywhere, especially on the sides of ditches ; if left alone by man it grows into a handsome tree, but the repeated wounds made by toddy-gatherers nearly always result in its typically stunted outline. The palmyra,[6] with its stout stem and crown of fan-shaped leaves, may be seen here and there, and in the neighbourhood of villages rows and scattered clumps of coconut palms[7] are often planted, their feathery heads towering above all other trees.

Good roads are few in Bengal, but where they are found a double row of fine trees often accompanies them. To the south of Calcutta the roads are often not specially planted for the benefit of wayfarers and the trees to be seen along them usually do not differ from those ordinarily met with in villages and in the surrounding countryside. But the old roads leading out of the city to the north and east were planted many years ago with rows of saplings intended to give shade to weary travellers, and those same trees, or their descendants and successors, are there to this day. The spread of industrialisation has done much to spoil some of these splendid avenues, but a drive along the Jessore Road will still show a seemingly unending and almost unbroken succession of venerable trees, their branches often meeting above and forming a green tunnel down which the highway disappears into the distance. In the cold season their leaves may be loaded with dust and lacking in freshness, but during the rains, when all are in full foliage, a more beautiful sight can hardly be found in the plains of India. Outstanding among them for size, and brightness of leaf, and venerable aspect, are the tamarinds,[8] which form a large proportion of these roadside giants. The banyan[9] and the peepul[10] are also abundant and these three kinds predominate always, but here and there the monotony is broken by other indigenous trees,—a silk-cotton,[11] a spreading *desi badam,*[12] a *gab*[13] with its gnarled bole and low, dense, dark green crown, or a lofty *jangli badam.*[14] In recent years gaps in the ranks have been filled by planting the teak,[15] the Spanish mahogony,[16] and the debdar,[17] but few of these have yet come to maturity, and their full beauty will not be attained for another fifty years or so. Still more recently a number of smaller trees, such as are now commonly grown in city streets, have been planted on country roadsides, but these look curiously out of place when compared with the old veterans that have been there for a hundred years or more and still look good for another century to come.

---

[1] *Acacia arabica* Willd.
[2] *Zizyphus Jujuba* Linn.
[3] *Flacourtia indica* (Burm. f.) Merr.
[4] *Calotropis gigantea* R. Br.
[5] *Phoenix sylvestris* Roxb. (*Khajur*).
[6] *Borassus flabellifer* Linn. (*Tal*).
[7] *Cocos nucifera* Linn. (*Narikel*).

## V. The City Streets

Until recent times the trees to be found in the streets of Calcutta were doubtless much the same as those that line the main roads of the Indian countryside to-day and are still almost the only trees to be seen in many small towns and villages. The survivors and descendants of these can be found to this day in many parts of Calcutta, especially in the poorer quarters, where the banyan, the peepul, and the neem are still the commonest trees. But for many years a wiser selection has been made by those responsible for planting our streets and avenues, and in the parts of the town that have recently been laid out a new type of tree has almost displaced the huge, untidy kinds on which the city once relied for shade. The qualities required in such trees are a reasonably quick rate of growth, a spreading shady head (preferably evergreen), a fairly long life, and a compact habit that will limit the ultimate size of the tree and will prevent it from throwing out sprawling limbs likely to interfere with neighbouring wires or buildings. It must be sturdy too, and should not be liable to shed its branches without warning, and must be able to stand up to the violent winds that occasionally sweep down the streets. If it bears beautiful flowers, so much the better, but this is a consideration of minor importance.

---

[8] *Tamarindus indica* Linn. (*Tentul*).
[9] *Ficus bengalensis* Linn. (*Bot*).
[10] *Ficus religiosa* Linn. (*Asvattha*).
[11] *Salmalia malabarica* Schott. et Endl. (*Simal*).
[12] *Terminalia Catappa* Linn.
[13] *Diospyros peregrina* Gurke.
[14] *Sterculia foetida* Linn.
[15] *Tectona grandis* Linn. f. (*Sagun*).
[16] *Swietenia Mahogoni* Linn.
[17] *Polyalthia longifolia* Hk. f. & T. (*Debdaru*).

Among the larger trees used for the purpose the commonest are perhaps the child-life tree,[1] the debdar,[2] and the Spanish mahogany[3] ; of these the two first are extremely suitable, but the third, although excellent in other respects and one of the finest trees to be found in India, will eventually attain a size that will probably be found too vast for most situations in a town. The *bakul*[4] and the devil tree, or *chhattin*,[5] are also excellent compact trees of fair size with dense evergreen foliage, and the former is very frequently planted in streets as well as in gardens. The *desi badam*[6] has horizontal branches, a flat head, and handsome bright green leaves, all of which make it suitable for street planting, but it is not as common in Calcutta as its merits warrant.

Coming now to trees of rather smaller proportions, we find that in recent years many streets have been lined with the *paras*,[7] or Portia tree, a quick-growing, evergreen tree with a rounded bushy head, leaves rather resembling in shape those of a peepul, and yellow hibiscus-like flowers ; where space is restricted a better choice can hardly be made. Another tree of rather similar habit, but slower in growth, is the Alexandrian laurel,[8] which has very beautiful evergreen leaves and pretty white flowers. Less common in Calcutta, though indigenous round about and often planted on roadsides, is the *karanja*,[9] or Indian beech, a handsome tree only marred by the fact that its foliage is prone to attack by a disease that causes it to turn an ugly whitish colour. In recent years the shapely Moreton Bay chestnut,[10] with bright green leaves and orange flowers, has been planted here and there, but it is probably too liable to damage by wind to be very suitable ; moreover its flowers are of no great merit because they are largely concealed by the leaves. *Lepisanthes tetraphylla* Radlk., a recent introduction from southern India, has been planted in some numbers ; it has dense evergreen foliage and a fairly compact habit, but no special beauty.

---

[1] *Putranjiva Roxburghii* Wall. (*Jia pata*).
[2] *Polyalthia longifolia* Hk. f. & T.
[3] *Swietenia Mahogoni* Linn.
[4] *Mimusops Elengi* Linn.
[5] *Alstonia scholaris* R. Br.
[6] *Terminalia Catappa* Linn.
[7] *Hibiscus populneus* Linn.
[8] *Calophyllum inophyllum* Linn.
[9] *Pongamia pinnata* (L.) Merr.
[10] *Castanospermum australe* A. Cunn.

A few trees are commonly grown in streets for their flowers, and some of the roads in the residential districts of Calcutta are a magnificent sight in the hot season when these are in bloom. Unfortunately, however, few of them are really suitable for street planting, because they are either too delicate and fragile or they provide insufficient shade. The *gul mohur,*[11] although planted in quite a large number of streets, is really only suitable for parks and gardens, because it has brittle branches and is easily blown over. Central Avenue has been largely lined with the *jarul,*[12] but these trees do not seem to thrive in such urban surroundings and, although their lilac-coloured flowers are beautiful for a short time in the hot weather, passers-by would probably prefer stronger trees and denser shade. The *jarul's* near relative *Lagerstroemia Thorellii* Gagnep., a recent introduction from Indo-China, has also been much planted, but although it thrives in Calcutta, it must be considered too small for an avenue tree. The only species that may be thought really suitable for street planting, and at the same time to be able to compare with the best for beauty of bloom, is *Peltophorum inerme* (Roxb.) Llanos, "the rusty shield bearer", which has handsome evergreen foliage, a compact growth, and a wealth of lovely yellow flowers, appearing in the hot weather and succeeded by attractive rust-coloured pods ; this is perhaps the best of all the ornamental trees to be found in India, and should be more widely planted everywhere.

Before leaving the streets of Calcutta we must mention once again the rain tree,[13] which was only introduced into India at the end of the last century but is already well-known in the city. Many streets in the suburbs are lined with this huge, quick-growing tree, which in thirty years can rival the oldest native in size and spread. Where there is space for its sprawling limbs it cannot be beaten as a shade-giver, but few, if any, of those to be found in Calcutta have yet reached maturity, and when they begin to do so it may be feared that falling branches will cause a great deal of trouble and damage. There is no doubt that they should really be confined to parks and the larger gardens, or to the sides of country roads.

---

[11] *Delonix regia* Raf.

[12] *Lagerstroemia speciosa* (L.) Pers.

[13] *Enterolobium Saman* Prain. (*Belati sirissa*).

## VI. THE MAIDAN

The famous Maidan, the great park that occupies the centre of Calcutta round Fort William, deserves special mention in this survey, for from one end to the other it is planted with fine trees and on them it depends for its beauty. One may travel many miles before reaching a more secluded and restful spot than some of its sequestered groves, and all "Ditchers" must bless those who for so long have kept clear of dwellings this great expanse of turf. A better place for a country walk than the centre of the "second city in the Empire" is hard to find in Bengal, and anyone who wants to become familiar with the trees of the province will be well advised to start there ; he will find most of the commonest kinds and a few rare ones as well.

When the Maidan was first laid out as a park, it must have been planted with the usual more or less indigenous shade-trees that have been used from time immemorial to line the great thoroughfares of India. Their survivors are still found in large numbers, and it is only in comparatively recent years that a selection of more ornamental kinds, many of them exotic, has been introduced. In most cases these have not yet had time to reach maturity and the larger trees are still mostly confined to a few species, the peepul,[1] the banyan,[2] and the *pakur*,[3] which have probably occupied their present sites since the park was first made at the time of the building of the present fort.

In recent years a number of trees valued for their flowers have been planted here and there, but most have been chosen for their shade, and it is certainly for this quality that they are chiefly valued. Not only do the countless pedestrians who daily cross the Maidan depend for shade on the rows of trees that line the roads, but the large herds of cattle, which subsist on the turf and so serve to keep it short and free from weeds, rely on them for shelter from the midday sun. The presence of these herds results in a curious effect, which is shared by most of the older trees on the Maidan ; their spreading branches reach to a great distance from the short trunk, but no twig approaches the ground because all are broken off as soon as they come within reach of the cowherds, who are always seeking more food for their hungry beasts ; in consequence the larger solitary trees all have the appearance of huge stunted mushrooms with heads rounded on top and perfectly flattened beneath.

---

[1] *Ficus religiosa* Linn. (*Aśvattha*).
[2] *Ficus bengalensis* Linn. (*Bot*).
[3] *Ficus infectoria* Roxb.

The following is a fairly exhaustive list of the trees to be found on the Maidan in 1944; it does not claim to be entirely complete because military activities have prevented a full exploration; moreover it excludes many kinds to be found only in the Curzon Gardens, the Eden Gardens, Fort William, the R. C. T. C. enclosures, and the grounds of the Victoria Memorial:—

*Dillenia indica* Linn. (*Chalta*). A single specimen near the Ladies' Golf Club Pavilion.

*Polylthia longifolia* Hk. f. & T. (*Debdaru*). One of the commonest of the more recently planted trees.

*Salmalia malabarica* Schott. et Endl. (*Simal*). The silk-cotton tree. A specimen on the west of Hospital Road.

*Sterculia foetida* Linn. (*Jangli badam*). The dung tree. Several trees along Chowringhee and on St. George's Gate Road.

*Pterygota alata* R. Br. (*Buddha narikela*). Buddha's coconut. A single tree near the junction of Mayo Road and Dufferin Road.

*Kleinhovia hospita* Linn. (*Bola*). A few trees, mostly near the centre of the Maidan.

*Pterospermum acerifolium* Willd. (*Kanak champa*). Not uncommon.

*Berria cordifolia* (Willd.) Burret. The Trincomali wood tree. A single specimen near the junction of Lower Circular Road with Chowringhee.

*Garuga pinnata* Roxb. (*Jum*). A single tree on the west of St. George's Gate Road.

*Azadirachta indica* A. Juss. (*Nim*). Fairly common.

*Swietenia Mahogoni* Linn. The Spanish mahogany. Common. A fine clump grows at the south end of Hospital Road, but no tree has yet approached maturity.

*Swietenia macrophylla* King. The Honduras mahogany. Planted here and there in recent years.

*Cedrela Toona* Roxb. (*Tun*). A single tree on the east of Mayo Road near its junction with Chowringhee.

*Appanamixis polystachya* (Wall.) R. N. Parker. (*Tikta raj*). A single female tree on the edge of Chowringhee opposite the Indian Museum.

*Schleichera oleosa* (Lour.) Merr. (*Kusum*). The lac tree.

Several trees on the west of Mayo Road and others near St. George's Gate.

*Euphoria Longana* Lam. (*Asphal*). The longan. A few trees here and there.

*Mangifera indica* Linn. (*Am*). The mango. A few trees near sports' pavilions.

*Myroxylon Pereirae* Klotsch. The Peru balsam tree. A single tree at the side of Chowringhee, to the north of its junction with Theatre Road.

*Dalbergia Sissoo* Roxb. (*Sisu*). Common.

*Dalbergia lanceolaria* Linn. f. (*Chakemdia*). A single tree on the west of Dufferin Road near the Red Road.

*Castanospermum australe* A. Cunn. The Moreton Bay chestnut. Several trees south of the Victoria Memorial and elsewhere.

*Peltophorum inerme* (Roxb.) Llanos. Fairly plentiful, especially near Casuarina Avenue.

*Delonix regia* Raf. (*Gul mohr*). Fairly plentiful, especially near the Eden Gardens.

*Colvillea racemosa* Boj. A few trees near Park Street.

*Cassia Fistula* Linn. (*Amaltas*). A few trees near Outram Ghat.

*Cassia siamea* Lam. Several trees along Chowringhee and elsewhere.

*Albizzia Lebbek* Bth. (*Sirissa*). Several trees east of Fort William, near the Chowringhee Gate.

*Albizzia Richardiana* King & Prain. A tree on Lower Circular Road, south of the Victoria Memorial.

*Enterolobium Saman* Prain. (*Belati sirissa*). The rain tree. Very common but no trees have yet reached maturity. Some have been planted in crowded clumps where none can develop properly.

*Terminalia Catappa* Linn. (*Desi badam*). Fairly common.

*Terminalia Arjuna* W. & A. (*Arjuna*). A single tree at the junction of Lower Circular Road with Hospital Road and another near Outram Ghat.

*Syzygium Cumini* (L.) Skeels. (*Kala jamb*). A single tree in a clump of other evergreens near the junction of Harrington Street with Chowringhee.

*Barringtonia acutangula* Gaertn. (*Hidjal*). A single tree to the west of Cathedral Road.

*Lagerstroemia speciosa* (L.) Pers. (*Jarul*). Common.

*Lagerstroemia Thorellii* Gagnep. Several trees on Strand Road.

*Anthocephalus indicus* A. Rich. (*Kadam*). A few trees including one or two on St. George's Gate Road.

*Mimusops Elengi* Linn. (*Bakul*). Common.

*Diospyros peregrina* Gurke. (*Gab*). A single tree near the junction of Mayo Road with the Red Road.

*Alstonia macrophylla* Wall. A single tree on the West of St. George's Gate Road near its junction with Strand Road.

*Millingtonia hortensis* Linn. f. A few trees including one on the north of Lower Circular Road by the Race Course.

*Dolichandrone spathacea* K. Schum. A single tree on the east of St. George's Gate Road.

*Kigelia pinnata* DC. The sausage tree. A young tree near the junction of Kidderpore Road with Casuarina Avenue, and another on the west of St. George's Gate Road.

*Tectona grandis* Linn. f. (*Sagun*). The teak. Frequent.

*Tectona Hamiltoniana* Wall. Several trees on the west of Cathedral Road.

*Trewia nudiflora* Linn. (*Pitali*). A single tree overhangs the north-east corner of the Birji Tank.

*Putranjiva Roxburghii* Wall. (*Jia pata*). The child-life tree. Common, especially along Chowringhee.

*Bischofia javanica* Bl. A single tree in a clump south-west of the junction of Harrington Street with Chowringhee.

*Trema orientalis* Bl. (*Jilan* or *chikun*). A tree west of Cathedral Road.

*Artocarpus integra* (Thunb.) Merr. (*Kathal*). The jack fruit. A few trees about the sports' pavilions and elsewhere.

*Ficus Benjamina* Linn. var. *comosa* Kurtz. The Java fig. A few young trees, including one on the east of St. George's Gate Road.

*Ficus retusa* Linn. (*Jir*). A few trees along Chowringhee.

*Ficus infectoria* Roxb. (*Pakur*). Fairly common; there are some fine old trees near the Kidderpore Bridge and another north of the Victoria Memorial.

*Ficus Rumphii* Bl. (*Gaiasvattha*). Occasional.

*Ficus religiosa* Linn. (*Asvattha*). The peepul. The commonest tree on the Maidan.

*Ficus bengalensis* Linn. (*Bot*). Very common. The aerial roots of this tree are seldom seen on the Maidan and never reach the ground ; the reason for this is not clear, because all the trees can hardly be of the variety that does not produce aerial roots.

*Casuarina equisetifolia* Forst. (*Belati jhau*). Formerly planted along Casuarina Avenue and elsewhere, but the trees suffered much from high winds and few now survive ; several serious accidents occurred as a result of their branches falling onto passing vehicles.

*Phoenix sylvestris* Roxb. (*Khajur*). The wild date palm.

*Borassus flabellifer* Linn. (*Tal*). The palmyra. A few of each of these palms grow on the south side of the Birji Tank.

There is one remarkable omission from the above list ; the last tamarind[4] known to the writer to exist on the Maidan was cut down in 1944. It is not clear why such a common and beautiful tree is not favoured by the authorities who are responsible for the planting of the park, but possibly it is feared that its branches would be damaged by people in search of fruit.

## VII. THE GARDENS

For centuries a number of beautiful plants, mostly of Indian origin but a few imported from other countries, have been cultivated for aesthetic reasons in Indian gardens, and since the early days of the nineteenth century a succession of enthusiastic European botanists and gardeners have added to the list of exotic plants grown in Calcutta, until to-day they hold perhaps one of the richest collections of tropical plants of horticultural interest to be found in the world. Very fine displays of ornamental trees may be seen in the Victorial Memorial Garden and in the grounds of the Tollygunge Club, as well as in the Royal Agri-Horticultural Garden and, of course, in the famous Royal Botanic Garden at Sibpur. Apart from the many rare kinds found only in these collections, a complete list of the trees cultivated in private gardens around and about Calcutta would certainly include nearly all the species described in this book and probably a good many more as well. To attempt a complete account of all these species is clearly impossible here and all that can be done is to mention some of the commonest and the most striking.

---

[4] *Tamarindus indica* Linn. (*Tentul* ; *imli*).

The following have red or orange flowers:—

*Salmalia malabarica* Schott. et Endl. (*Simal*). The silk-cotton tree. A tall deciduous tree bearing large crimson flowers in early spring among the bare branches.

*Erythrina indica* Lam. (*Palita mandar*). A small tree or a shrub, bearing clusters of crimson flowers in early spring before the leaves appear.

*Butea monosperma* Ktz. (*Palas*). "The flame of the forest". An ungainly tree with large leaves, bearing in the early spring masses of scarlet flowers with brown-velvety calyces. Scarce in Calcutta.

*Delonix regia* Raf. (*Gul mohr*). "The gold mohur". A spreading tree with feathery leaves, bearing magnificent red or orange flowers at the end of the hot weather. Common.

*Colvillea racemosa* Boj. A rather rare relative of the last ; bears tight clusters of dull orange flowers in August and September.

*Saraca indica* Linn. (*Asoka*). A low, spreading, evergreen tree bearing in the hot weather masses of small crimson, orange, or yellowish flowers close to the branches.

*Brownea coccinea* Jacq. A tree similar in general appearance to the last, bearing large dense clusters of bright red flowers in the hot season and also during the rains.

*Amherstia nobilis* Wall. A low tree rather similar to the last two, bearing in the hot season magnificent pendulous sprays of scarlet and yellow flowers.

*Callistemon lanceolatus* Sweet. The bottle-brush tree. A small evergreen tree with very narrow pointed leaves and red flowers arranged in cylindrical spikes near the ends of the twigs.

*Cordia Sebestena* Linn. A low evergreen tree or shrub, bearing almost all the year round small clusters of orange-red flowers at the ends of the twigs.

*Spathodea campanulata* Beauv. The African tulip-tree. A fairly tall evergreen tree bearing in the early spring large crimson flowers in compact clusters at the ends of the branches.

The following have pink or mauve flowers:—

*Hibiscus mutabilis* Linn. (*Sthalpadma*). The changeable rose. A small tree or shrub with broad, lobed leaves and large flowers, which, in the typical variety, open pure white in the morning and fade through pink to deep crimson in the evening ; other varieties remain pink throughout.

*Kleinhovia hospita* Linn. A fairly tall evergreen tree with broad leaves, bearing small pink flowers during the latter part of the rains.

*Sesbania grandiflora* Pers. (*Agati*). A small quick-growing tree, bearing large pink or white flowers from September to April.

*Pongamia pinnata* (L.) Merr. (*Karanja*). The Indian beech. A middle-sized, nearly evergreen tree with shining, bright green leaves and rather inconspicuous, dull pink or mauve flowers, borne in May or June.

*Gliricidia maculata* H.B.K. A small tree bearing pale pink or almost white flowers in dense clusters scattered along the otherwise bare branches in early spring.

*Millettia ovalifolia* Kurz. A very pretty little deciduous tree with a rounded crown and drooping twigs, bearing a profusion of bright mauve flowers in the early part of the hot season.

*Cassia nodosa* Buch.-Ham. A small spreading tree bearing pink and white flowers during the hot season. (There are four other species of *Cassia* with pink flowers ; for the differences between them see the key under the description of the genus).

*Bauhinea variegata* Linn. A small tree with leaves shaped like a camel's hoof-print, bearing in the early spring large white, pink, or purplish flowers on the bare branches.

*Bauhinea purpurea* Linn. (*Deva kanchan*). A tree similar to the last but bearing its flowers among the leaves at the end of the rains.

*Enterolobium Saman* Prain. (*Belati sirissa*). The rain tree. A large spreading tree bearing rather inconspicuous pink flowers in the hot season and rains.

*Lagerstroemia speciosa* (L.) Pers. (*Jarul*). A tall tree with leaves in opposite pairs, bearing large flowers in open clusters at the ends of the branches in April and May. The common form has lilac flowers but there are varieties with pink and cerise flowers.

*Lagerstroemia Thorellii* Gagnep. A tree very similar to the last but smaller in all its parts ; bears mauve or pale purplish flowers during the rains.

The following have bright yellow flowers:—

*Cochlospermum Gossypium* DC. The yellow silk-cotton. A small tree with broad, lobed leaves, bearing large yellow flowers on the bare branches early in March. Scarce in Calcutta.

*Hibiscus populneus* L. (*Paras*). The Portia tree. A middle-sized, evergreen tree with leaves shaped rather like those of the peepul, and yellow, hibiscus-like flowers which fade to dull purple.

*Pterocarpus indicus* Willd. The padauk. A lofty evergreen tree bearing yellow flowers at the end of the hot season. Rather scarce in Calcutta.

*Brya Ebenus* DC. A low, slender, evergreen tree, or a shrub, with very small dark green leaves grouped in pairs, and scented orange flowers borne throughout the hot weather and rains. Very common.

*Caesalpinea Cacalaco* Humb. & Bompl. A middle-sized evergreen tree bearing yellow flowers in stiff spikes clustered at the ends of the branches in December and January. Scarce in Calcutta.

*Peltophorum inerme* (Roxb.) Llanos. An evergreen tree of moderate size bearing yellow flowers in large clusters at the ends of the branches during the hot season. Common.

*Cassia Fistula* Linn. (*Amaltas*). "The Indian laburnum". A small deciduous tree bearing beautiful pendulous sprays of yellow flowers towards the end of the hot weather.

*Cassia glauca* Lam. An evergreen shrub or a small tree, bearing numerous small clusters of yellow flowers at most seasons; the leaves are of a rather bluish green.

*Cassia multijuga* Rich. A beautiful shrub or a small tree with bright green leaves and a rather straggling habit; the flowers are borne in large clusters at the ends of the branches in October or November. Not common.

*Acacia moniliformis* Griseb. A medium-sized evergreen tree with drooping twigs and minute yellow flowers combined in small spikes; the flowers are produced at intervals almost throughout the year. Common.

*Vachellia Farnesiana* (L.) W. & A. A small thorny tree or a shrub with minute yellow flowers joined in small spherical heads; very like the common *babul* (*Acacia* *arabica* Willd.), but the flowers are scented. Blooms from June to February. Not very common.

*Thevetia peruviana* (Pers.) Merr. (*Kokla phul*). "The yellow oleander". A small spreading evergreen tree with very narrow leaves and large, yellow, pinkish, or whitish flowers borne almost all the year round. Very common.

*Tecoma stans* Juss. An evergreen shrub or small tree bearing tubular yellow flowers in small clusters throughout the hot weather and rains. Common.

The following have blue or lilac-coloured flowers:—

*Lagerstroemia speciosa* (L.) Pers. (*Jarul*). The common variety of this tree has lilac-coloured flowers. It is a tall tree, though it often blooms when only about 15 feet high. The flowers appear in April and May.

*Jacaranda filicifolia* D. Don. A medium-sized, deciduous tree with fern-like leaves and numerous pale-violet flowers borne in clusters along the bare twigs, mostly in February and March. Scarce.

*Jacaranda ovalifolia* R. Br. A tree similar to the above but taller, with more finely divided leaves, and flowering later in March and April, or even later. Scarce.

The following have flowers that are predominantly white or cream-coloured:—

*Muntingia Calabura* Linn. "The Chinese cherry". A small, spreading, evergreen tree with pointed leaves, which are silvery beneath, small white flowers, and cherry-like fruits. Common.

*Murraya paniculata* (L.) Jacq. (*Kamini*). An evergreen shrub or small tree with dark green leaves and short clusters of scented white flowers. Common.

*Gardenia florida* Willd. (*Gandharaj*). An evergreen shrub or small tree with large, "double", white, scented flowers which turn yellowish-brown as they get old. Common.

*Plumeria rubra* L. *forma acutifolia* (Poir.) Woodson. (*Gorurchampa*). The frangipani. A small deciduous tree with large, dark green leaves and soft, thick twigs; the tubular white and yellow flowers are borne at the ends of the twigs throughout the hot weather and rains.

There are several other species and cultivated varieties, some of which have red or yellow flowers, or various combinations of pink, yellow, and white. Very common.

*Ervatamia divaricata* (L.) Burkill. (more often known as *Tabernaemontana coronaria* R. Br.). (*Tagur*). An evergreen shrub or small spreading tree with narrow shining leaves and numerous white flowers, scented at night, borne almost throughout the year. Some varieties have flowers with yellow eyes and others have "double" flowers. Very common.

*Holarrhena antidysenterica* Wall. (*Kurchi*). The Easter tree. A small deciduous tree bearing creamy-white, scented flowers on the bare twigs in March and April. Common.

*Millingtonia hortensis* Linn. (*Akas nim*). The Indian cork tree. A tall tree with corky bark, nearly vertical limbs and drooping twigs ; the long, tubular, white, scented flowers appear in November and December. Fairly common.

The following are grown chiefly for their handsome foliage:—

*Polyalthia longifolia* Hk. f. & T. var. *pendula*. A variety of the common debdar with short drooping branches giving the tree a pillar-like outline resembling that of a Lombardy poplar.

*Peltophorum brasiliense* Urmb. A low evergreen tree with very graceful foliage and slender, spreading branches ; it occasionally bears small clusters of yellow flowers.

*Haematoxylon campechianum* Linn. The logwood tree. A low spreading tree with delicate foliage not unlike that of the last. It bears small, pale yellow flowers from January to March.

*Albizzia Richardiana* King. A very beautiful, lofty, evergreen tree with smooth bark, a few gradually spreading limbs, and feathery foliage borne only at the tips of the branches, forming a graceful, rounded crown. Fairly common.

*Eucalyptus citriodora* Hk. The lemon-scented eucalypt. A fairly tall tree with a slender trunk, a few slender branches, and sparse foliage consisting of narrow, pointed leaves, highly scented when rubbed.

*Grevillea robusta* A. Cunn. A fairly tall tree with a slender outline and fern-like leaves, dark green above and silvery-grey beneath.

*Araucaria Cookii* R. Br. A tall tree with stiff, dark green foliage consisting of thorn-like leaves crowded on green twigs.

*Araucaria Cunninghamii* Sweet. A tall tree rather like the last, but with softer, more cypress-like foliage.

*Thuja orientalis* Linn. A dense, evergreen shrub or small tree, often pyramidal in shape, with flat fern-like foliage.

In conclusion mention must be made of the various palms that make up an important part of the ornamental vegetation in Calcutta. In former days indigenous palms were much grown in Indian parks and gardens but they have now been almost entirely replaced by more graceful exotic kinds, of which a number are planted in and about the city. These will be found fully described later in this book, and it is hoped that the key will make it fairly easy to identify them. Any more condensed description would be of little or no value and will not be attempted here.

* * * *

Finally a few facts about the origin of the trees grown in Calcutta may be worth recording. 276 plants are described in this book, of which 69 may be considered native or naturalised in the neighbourhood and their origins are analysed under the heading of "The Wild" above ; of the remaining 207 species, 91 are indigenous in other parts of India ; 50 though not natives of India are indigenous elsewhere in Asia ; 14 are natives of Africa ; 42 of America ; 9 of Australia ; and 1 of the South Sea Islands.

# KEY

*To find the name of a tree, refer to Division No. 1 and of the two alternative descriptions choose the one that applies to the tree. Then refer to the division indicated against that alternative, choose a second alternative, and so on till the name of the tree is reached.*

*With a little practice a short cut can be taken by referring directly to the main headings printed in capitals in the centre of the page. These mostly have reference to the structure, shape, or arrangement of the leaves.*

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 1 | Trees without branches ; leaves very large, usually clustered at the top of the trunk. . . . . . . . . . . . . . . . . . . | **2** | |
| | Trees with branches. . . . . . . . . . . . . . . . . . . | **26** | |
| 2 | Trunks hard and woody. . . . . . . . . . . . . . . . . . . | **3** | |
| | Trunks soft ; small trees. . . . . . . . . . . . . . . . . . . | **23** | |
| | **PALMS & CYCADS** | | |
| 3 | Leaves divided into numerous short leaflets ; leaflets triangular, springing from lateral branches of the main leaf-stalk ; ends of leaflets broad and ragged ; leaves not all clustered at the top of the trunk. . . . . . . | CARYOTA URENS | 453 |
| | Leaves not divided into separate leaflets, *or* leaflets long and narrow ; leaves all clustered at the top of the trunk. . . . . . . . . . . . . | **4** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 4 | Leaves fan-shaped ; divisions of the leaf radiating from the centre of the leaf. ("Fan palms"). . . . . . . . . . . . . . . . . . . . | 5 | |
| | Leaves divided into 2 rows of narrow leaflets on opposite sides of a central midrib. ("Feather palms"). . . . . . . . . . . . . . . . . . . | 9 | |
| 5 | Trunk not more than 15″ thick. . . . . . . . . . . . . . . . . . . | 6 | |
| | Trunk over 18″ thick. . . . . . . . . . . . . . . . . . . . . . | 8 | |
| 6 | Divisions of leaf long and pointed, split into 2 halves and drooping. . | LIVISTONA CHINENSIS | 439 |
| | Divisions of leaf not drooping. . . . . . . . . . . . . . . . . . | 7 | |
| 7 | Base of leaf-stalk covered with a fibrous network ; leaf-stalks about as long as leaves. . . . . . . . . . . . . . . . . . . . . . . | THRINAX *SPEC.* | 441 |
| | Base of leaf-stalk not covered with a fibrous network ; leaf-stalks much longer than leaves. . . . . . . . . . . . . . . . . . . . . . | LIVISTONA ROTUNDIFOLIA | 440 |
| 8 | Leaf-stalk less than 5 feet long ; fruit 6″ across ; male and female flowers on separate trees (dioecious). . . . . . . . . . . . . . . . . | BORASSUS FLABELLIFER | 442 |
| | Leaf-stalk at least 5 feet long ; fruit less than 2″ across ; flowering branches enormous ; trees flower once and then die. . . . . . . . | CORYPHA *SPEC.* | 434 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 9 | Leaves over 16 feet long; trunk usually short. | 10 | |
| | Leaves less than 15 feet long. | 12 | |
| 10 | Base of leaves covered with thick black hairs; flowers in clusters of long drooping spikes. | ARENGA PINNATA | 455 |
| | Base of leaves not covered with hairs; flowers not in long drooping spikes. | 11 | |
| 11 | Leaflets at base of leaf long and drooping; flowers in large branched clusters. | ATTALEA SPECIOSA | 452 |
| | Leaflets at base of leaf short and spinous; flowers in short compact clusters; leaf-stalks thorny. | ELAEIS GUINEENSIS | 446 |
| 12 | Leaves number more than 40, dark green, about 6 feet long; leaflets thick and leathery; trunk less than 15 feet high, about 1 foot thick. | CYCAS *SPEC.* | 481 |
| | Leaves less than 40; leaflets not thick and leathery. | 13 | |
| 13 | Trunk more or less rough with the stumps of old leaves; lowest or all the leaves with spine-like tips; leaves of mature tree 20 or more. | 14 | |
| | Trunk not covered with the stumps of old leaves; leaflets not spinous; leaves less than 18. | 15 | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 14 | Leaflets in centre of leaf 2 to 4 feet long, 1½ to 2 inches broad (but much smaller near base of leaf). . . . . . . . . . . . . . . . . . . | ELAEIS GUINEENSIS | 446 |
|  | Leaflets not more than 18″ long by 1″ broad. . . . . . . . . . | PHOENIX SYLVESTRIS | 431 |
| 15 | Trunk more than 10″ thick. . . . . . . . . . . . . . . . . . | **16** |  |
|  | Trunk less than 10″ thick, except at the base. . . . . . . . . . | **18** |  |
| 16. | Trunk about 12″ thick, dark in colour, crooked. . . . . . . . . | COCOS NUCIFERA | 448 |
|  | Trunk about 2 feet thick above the base, narrow and green for about 4 feet below the leaves. . . . . . . . . . . . . . . . . . . . | **17** |  |
| 17 | Trunk narrowed suddenly near the top, often swollen in the middle. . | ROYSTONEA REGIA | 463 |
|  | Trunk - gradually narrowed upwards. . . . . . . . . . . . . . . | ROYSTONEA OLERACEA | 464 |
| 18 | Trunk more than 4″ thick, usually solitary. . . . . . . . . . . | **19** |  |
|  | Trunks seldom more than 4″ thick, in clumps. . . . . . . . . . | **21** |  |
| 19 | Leaves more than 8′ long ; leaflets all separate. . . . . . . . . . | **20** |  |
|  | Leaves less than 8′ long ; outer leaflets joined ; trunk very straight and lofty. . . . . . . . . . . . . . . . . . . . . . . . . | ARECA CATECHU | 457 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 20 | Base of leaf-stalk greyish-green. | EUTERPE *SPEC.* | 465 |
| | Base of leaf-stalk brownish. | COCOS PLUMOSA | 448 |
| 21 | Trunks 2″ to 3″ thick with conspicuous rings ; leaflets closely crowded on midrib. | **22** | |
| | Trunks 3″ to 6″ thick without conspicuous rings ; leaflets widely separated, about ¼″ wide. | CHRYSALIDOCARPUS MADAGASCARIENSIS | 460 |
| 22 | Trunks about 3″ thick ; leaflets pointed, about 1 ″wide, light green. | CHRYSALIDOCARPUS LUTESCENS | 459 |
| | Trunks about 2″ thick ; leaflets blunt with ragged ends, 1″ to 3″ wide, dark green. | PTYCHOSPERMA MACARTHURI | 461 |
| | **BANANA, TRAVELLER'S TREE, PAPIYA, CASTOR-OIL** | | |
| 23 | Leaves over 4′ long, narrow, not lobed but slit by the wind when old. | **24** | |
| | Leaves not more than 3′ long, lobed. | **25** | |
| 24 | Leaves spreading in all directions from top of stem. | MUSA *SPEC.* | 422 |
| | Leaves in one row forming a fan-shaped head to the tree. | RAVENALA MADAGASCARIENSIS | 426 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 25 | Leaf-stalks over 2′ long; flowers below or among the leaves; fruits large, smooth. . . . . . . . . . . . . . . . . . . . . . | CARICA PAPIYA | 267 |
| | Leaf-stalks not more than 1′ long; flowers above the leaves; fruit small, usually prickly. . . . . . . . . . . . . . . . . . . . | RICINUS COMMUNIS | 377 |
| | **SCREW-PINE, BAMBOOS** | | |
| 26 | Leaves over 4′ long, less than 6″ wide, arranged spirally at tops of branches. . . . . . . . . . . . . . . . . . . . . | PANDANUS TECTORIUS | 428 |
| | Leaves less than 4′ long. . . . . . . . . . . . . . . . . . . . | 27 | |
| 27 | Stems straight, slender, usually hollow, tapering gradually upwards; branches numerous and very slender, springing from more or less equidistant joints (nodes) on the main stem; leaves narrow and pointed. (Bamboos). | 28 | |
| | Branches not spreading from more or less equidistant joints. . . . . | 32 | |
| 28 | Leaves over 2″ wide. . . . . . . . . . . . . . . . . . . . . | DENDROCALAMUS GIGANTEUS | 473 |
| | Leaves not more than 2″ wide. . . . . . . . . . . . . . . . . . | 29 | |
| 29 | Stems armed by long spines near the base. . . . . . . . . . . . | BAMBUSA ARUNDINACEA | 470 |
| | Stems not spinous. . . . . . . . . . . . . . . . . . . . . . . | 30 | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 30 | Lower nodes giving off leafless branches ; all nodes distinctly swollen ; leaves 1″ to 2″ wide. . . . . . . . . . . . . . . . . . . . | BAMBUSA BALCOOA | 469 |
| | Lower nodes not giving off leafless branches ; nodes not much swollen. . | **31** | |
| 31 | Nodes not swollen ; stems dark greyish-green ; walls of stem thick. . . | BAMBUSA TULDA | 468 |
| | Nodes slightly swollen with a hard sharp ridge ; stems often yellowish or orange ; walls of stem thin. . . . . . . . . . . . . . . . . . | BAMBUSA VULGARIS | 471 |
| 32 | Branches soft and fleshy, full of milky juice, green when young ; flowers very small. . . . . . . . . . . . . . . . . . . . | **33** | |
| | Branches not soft, fleshy, and milky. . . . . . . . . . . . . . | **36** | |
| | **EUPHORBIA** | | |
| 33 | Smallest branches slender, like stout rushes, thornless ; leaves very small or none. . . . . . . . . . . . . . . . . . . . | EUPHORBIA TIRUCALLI | 366 |
| | Branches more than ½″ thick, often thorny. . . . . . . . . . . | **34** | |
| 34 | Branches sharply angled with undulating and thorny ridges ; leaves very small. . . . . . . . . . . . . . . . . . . . | EUPHORBIA ANTIQUORUM | 370 |
| | Branches round or slightly angled ; leaves at least 6″ long. . . . . | **35** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 35 | Branches 5-angled, with spines arranged in pairs on swollen nodes. . . | EUPHORBIA NERIIFOLIA | 369 |
| | Branches round ; spines, if present, on flat corky patches. . . . . | EUPHORBIA NIVULIA | 368 |
| | **PINE** | | |
| 36 | Leaves like slender green needles, in clusters of 3. . . . . . . . . | PINUS LONGIFOLIA | 477 |
| | Leaves not needle-like. (N.B. A few trees have slender green twigs that may be mistaken for pine-needles. These all follow immediately below.) | **37** | |
| 37 | Leaves minute or apparently wanting ; branches set with slender green twigs which serve the purpose of leaves. . . . . . . . . . . . | **38** | |
| | Leaves more than ⅛″ long. . . . . . . . . . . . . . . . . . | **42** | |
| | **LEAVES MINUTE OR VERY SMALL** | | |
| 38 | Flowers yellow, about ½″ wide ; branches thorny. . . . . . . . . | PARKINSONIA ACULEATA | 175 |
| | Flowers minute, or at most ¼″ wide. . . . . . . . . . . . . . | **39** | |
| 39 | Twigs round, in clusters or spikes, spreading in all directions. . . . | **40** | |
| | Twigs flat, set in one plane, forming flat ends to the branches rather like the fronds of a fern. . . . . . . . . . . . . . . . . . | THUJA ORIENTALIS | 478 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 40. | Large tree with drooping twigs ; flowers minute ; male flowers at ends of twigs ; female flowers in small cone-like heads. . . . . . . . | CASUARINA EQUISITIFOLIA | 421 |
| | Small trees ; flowers in conspicuous clusters, pink, mauve, or white. . . | **41** | |
| 41 | Twigs 2″ long or more ; flowering spikes in open clusters. . . . . . | TAMARIX ARTICULATA | 27 |
| | Twigs mostly not more than 1″ long ; flowering spikes in dense clusters. | TAMARIX GALLICA | 25 |
| 42 | Leaves about ¼″ long, thorn-like, closely set on green twigs. . . . . | **43** | |
| | Leaves flat. . . . . . . . . . . . . . . . . . . . | **44** | |
| 43 | Twigs branched or forked. . . . . . . . . . . . . . . . . | ARAUCARIA CUNNINGHAMII | 476 |
| | Twigs neither branched nor forked. . . . . . . . . . . . . . | ARAUCARIA COOKII | 475 |
| | **LEAVES CUP-SHAPED** | | |
| 44 | Leaves double at the base, forming a cup. . . . . . . . . . . . | FICUS KRISHNAE | 416 |
| | Leaves not cup-shaped at the base. . . . . . . . . . . . . . | **45** | |
| 45 | Leaves not divided into separate leaflets. . . . . . . . . . . . | **46** | |
| | Leaves divided into separate leaflets. . . . . . . . . . . . . | **207** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 46 | Edges of leaves lobed ; lobes ½″ wide or wider. . . . . . . . . . . | **47** | |
| | Edges of leaves not lobed, or lobes less than ½″ wide. . . . . . . | **65** | |
| 47 | Lobes of leaf 2 only. . . . . . . . . . . . . . . . . . . . . . . . | **48** | |
| | Lobes of leaf more than 2. . . . . . . . . . . . . . . . . . . . . . | **49** | |
| | **LEAVES SIMPLE, LOBED** | | |
| 48 | Lobes reaching ⅓ to ½ way down leaf ; flowers in autumn. . . . . | BAUHINEA PURPUREA | 202 |
| | Lobes reaching ¼ to ⅓ way down leaf ; flowers in spring. . . . . . | BAUHINEA VARIEGATA | 203 |
| 49 | Flowers chocolate-coloured, 1″ long or more ; leaves 6″ to 18″ long, very variable ; a small tree or shrub. . . . . . . . . . . . . . . . | ABROMA AUGUSTA | 61 |
| | Flowers not chocolate-coloured. . . . . . . . . . . . . . . . . . . | **50** | |
| 50 | Leaves very irregularly shaped, no two the same. . . . . . . . . . | PTERYGOTA ALATA *VAR*. DIVERSIFOLIA | 52 |
| | Leaves more or less regular in shape. . . . . . . . . . . . . . . . | **51** | |
| 51 | Leaves more than 12″ long. . . . . . . . . . . . . . . . . . . . . | **52** | |
| | Leaves not more than 12″ long. . . . . . . . . . . . . . . . . . . | **55** | |

IV

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 52 | Flowers about 2″ wide, purplish-blue fading to white. . . . . . . | SOLANUM MACRANTHUM | 329 |
| | Flowers less than 1½″ across, not blue. . . . . . . . . . . . . | **53** | |
| 53 | Leaves about as wide as long ; flowers dark red and yellow ; a large tree. | STERCULIA VILLOSA | 49 |
| | Leaves much longer than wide ; small trees with soft-wooded stems. . . | **54** | |
| 54 | Leaf-stalks over 2′ long ; flowers below or among the leaves ; fruits large, smooth. . . . . . . . . . . . . . . . . . . . . | CARICA PAPAYA | 267 |
| | Leaf-stalks not more than 1′ long ; flowers above the leaves ; fruit small, prickly. . . . . . . . . . . . . . . . . . . . . | RICINUS COMMUNIS | 377 |
| 55 | Flowers distinct and separate, not combined in compact spikes or heads. | **56** | |
| | Flowers minute, combined in pendulous catkin-like spikes, or in compact heads. . . . . . . . . . . . . . . . . . . . . | **64** | |
| 56 | Flowers more than 2″ wide or long. . . . . . . . . . . . . . | **57** | |
| | Flowers less than 2″ wide or long. . . . . . . . . . . . . . | **61** | |
| 57 | Petals bright yellow. . . . . . . . . . . . . . . . . . . | COCHLOSPERMUM GOSSYPIUM | 19 |
| | Petals white or pink. . . . . . . . . . . . . . . . . . . | **58** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 58 | Petals white, not longer than the sepals; leaves shallowly and irregularly lobed | **57** | |
| | Petals white or pink, much longer than the sepals; leaves with 3 or 5 regular lobes. | HIBISCUS MUTABILIS | 37 |
| 59 | Leaves nearly as broad as long; flowers 5″ to 6″ long. | PTEROSPERMUM ACERIFOLIUM | 57 |
| | Leaves much longer than broad; flowers not more than 4″ long. | **60** | |
| 60 | Flowers about 3″ long. | PTEROSPERMUM HEYNEANUM | 56 |
| | Flowers less than 2″ long. | PTEROSPERMUM LANCEAEFOLIUM | 59 |
| 61 | Flowers more than ½″ long. | **62** | |
| | Flowers less than ½″ long. | **63** | |
| 62 | Flowers whitish. | PTEROSPERMUM SUBERIFOLIUM | 56 |
| | Flowers not whitish. | ERYTHROPSIS COLORATA | 52 |
| 63 | Flowers white; a large tree. | ALEURITES MOLUCCANA | 391 |
| | Flowers greenish-yellow; a small soft-wooded tree. | JATROPHA CURCAS | 372 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 64 | Male flowers in pendulous catkin-like spikes; female flowers in spherical heads. . . . . . . . . . . . . . . . . . . . | BROUSSONETIA PAPYRIFERA | 398 |
| | Male and female flowers separate in cylindrical heads. . . . . . . . | MORUS *SPEC.* | 396 |
| 65 | Edges of leaves toothed, notched, or saw-like. . . . . . . . . . . | **66** | |
| | Edges of leaves smooth, neither toothed nor notched. . . . . . . | **95** | |
| | **LEAVES SIMPLE, DENTATE OR SERRATE** | | |
| 66 | Flowers in the *interior* of berry-like "receptacles", which are about ¾″ wide; leaves 8″ to 16″ long, very rough. . . . . . . . . . . . | FICUS HISPIDA | 416 |
| | Flowers not in the interior of receptacles. . . . . . . . . . . . | **66*A*** | |
| 66A | Flowers at least ⅓″ wide. . . . . . . . . . . . . . . . . . . | **67** | |
| | Flowers less than ⅓″ wide. . . . . . . . . . . . . . . . . . | **82** | |
| 67 | Flowers white or whitish. . . . . . . . . . . . . . . . . . . | **68** | |
| | Flowers not whitish. . . . . . . . . . . . . . . . . . . . . | **73** | |
| 68 | Flowers over 1½″ wide. . . . . . . . . . . . . . . . . . . . | **69** | |
| | Flowers less than 1″ wide. . . . . . . . . . . . . . . . . . . | **70** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 69 | Flowers about 5″ wide. . . . . . . . . . . . . . . . . . . | DILLENIA INDICA | 1 |
| | Flowers about 2″ wide ; leaves coarsely and irregularly toothed near the tip only. . . . . . . . . . . . . . . . . . . . | PTEROSPERMUM LANCEAEFOLIUM | 59 |
| 70 | Flowers in dense clusters at the ends of the twigs ; leaves up to 10″ long. | ERIOBOTRYA JAPONICA | 226 |
| | Flowers not in clusters at the ends of the twigs ; leaves not more than 6″ long. . . . . . . . . . . . . . . . . . . . | **71** | |
| 71 | Leaves silvery beneath. . . . . . . . . . . . . . . . . . | MUNTINGIA CALABURA | 66 |
| | Leaves not silvery beneath. . . . . . . . . . . . . . . . . | **72** | |
| 72 | Leaves seldom more than 3″ long ; sepals less than ⅓″ long. . . . . | GREWIA MULTIFLORA | 64 |
| | Leaves 3″ to 9″ long ; sepals at least ⅓″ long. . . . . . . . . . | GREWIA GLABRA | 65 |
| 73 | Flowers 3″ to 4″ wide, yellow or reddish with a deep crimson eye ; leaves silvery-grey beneath. . . . . . . . . . . . . . . . . . | HIBISCUS TILIACEUS | 35 |
| | Flowers without a deep crimson eye. . . . . . . . . . . . . . | **74** | |
| 74 | Flowers pink. . . . . . . . . . . . . . . . . . . . | **75** | |
| | Flowers yellow, greenish, or chocolate-coloured. . . . . . . . . . | **78** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No |
|---|---|---|---|
| 75 | Flowers in long pendulous spikes. . . . . . . . . . . . . . . . | **76** | |
| | Flowers not in pendulous spikes, 2" to 4" wide. . . . . . . . . . | **77** | |
| 76 | Flowers about ⅓" wide. . . . . . . . . . . . . . . . . . . . . | BARRINGTONIA ACUTANGULA | 252 |
| | Flowers about 2½" wide. . . . . . . . . . . . . . . . . . . . | BARRINGTONIA RACEMOSA | 251 |
| 77 | Tall tree ; leaves about twice as long as broad ; flowers in spikes. . . | CAREYA ARBOREA | 254 |
| | Small tree ; leaves about 4 times as long as broad ; flowers not in spikes. | GUSTAVIA AUGUSTA | 256 |
| 78 | Flowers greenish. . . . . . . . . . . . . . . . . . . . . . . | CASEARIA TOMENTOSA | 265 |
| | Flowers not greenish. . . . . . . . . . . . . . . . . . . . . | **79** | |
| 79 | Flowers chocolate-coloured. . . . . . . . . . . . . . . . . . | ABROMA AUGUSTA | 61 |
| | Flowers yellow. . . . . . . . . . . . . . . . . . . . . . . . | **80** | |
| 80 | Leaves at least 1' long. . . . . . . . . . . . . . . . . . . . | DILLENIA PENTAGYNA | 1 |
| | Leaves less than 10" long. . . . . . . . . . . . . . . . . . . | **81** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **81** | Leaves smooth and hairless. | OCHNA SQUARROSA | 97 |
| | Leaves minutely hairy. | GREWIA SUBINAEQUALIS | 64 |
| **82** | Flowers about ¼" wide. | **83** | |
| | Flowers very small or minute. | **86** | |
| **83** | Flowers yellow, sometimes with dark red appendages on the petals. | GUAZUMA TOMENTOSA | 60 |
| | Flowers greenish. | **84** | |
| **84** | Twigs spinous ; leaves less than 3" long. | ZIZYPHUS JUJUBA | 114 |
| | Twigs not spinous ; leaves mostly more than 3" long. | **85** | |
| **85** | Leaves usually in opposite pairs ; flowers all similar and bisexual ; stamens 5. | ELAEODENDRON GLAUCUM | 112 |
| | Leaves not in opposite pairs ; male and female flowers distinct but usually growing together ; stamens about 12 in male flowers, none in female flowers. | CROTON OBLONGIFOLIUS | 374 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 86 | Flowers in large conspicuous sprays or clusters, mostly at the ends of the twigs. . . . . . . . . . . . . . . . . . . . . . | **87** | |
| | Flowers minute ; scattered or in small heads, catkins, or clusters, generally arranged along the branches ; flowers often unisexual, the male and female flowers sometimes on separate trees. . . . . . . . . . . . . | **88** | |
| 87 | Flowers white ; leaves not in opposite pairs. . . . . . . . . . . . . | EHRETIA SERRATA | 326 |
| | Flowers yellowish ; leaves in opposite pairs, or nearly so. . . . . . . | TERMINALIA ARJUNA | 234 |
| 88 | Flowers combined in pendulous catkin-like spikes or in compact heads. | **89** | |
| | Flowers distinct and separate, not combined in pendulous spikes or in compact heads. . . . . . . . . . . . . . . . . . . . . . | **91** | |
| 89 | Leaves leathery, smooth, very finely toothed or notched. . . . . . . . | EXCAECARIA AGALLOCHA | 382 |
| | Leaves not leathery, rather rough, coarsely toothed or lobed. . . . . | **90** | |
| 90 | Male flowers in pendulous catkin-like spikes ; female flowers in spherical heads. . . . . . . . . . . . . . . . . . . . . . | BROUSSONETIA PAPYRIFERA | 398 |
| | Male and female flowers in separate cylindrical heads. . . . . . . . | MORUS *SPEC.* | 396 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 91 | Leaf-stalks less than ⅛" long. . . . . . . . . . . . . . . . . . | **92** | |
| | Leaf-stalks at least ¼" long. . . . . . . . . . . . . . . . . . | **94** | |
| 92 | Leaves 2" to 4" long ; twigs not thorny. . . . . . . . . . . . | **93** | |
| | Leaves mostly less than 2" long ; twigs thorny. . . . . . . . . | FLACOURTIA INDICA | 23 |
| 93 | Leaves very thin and delicate ; trunk and larger branches often spinous. | FLACOURTIA JANGOMAS | 22 |
| | Leaves thick and rough ; tree without spines. . . . . . . . . . | STREBLUS ASPER | 394 |
| 94 | Leaves smooth and shining on upper surface ; twigs drooping. . . . | PUTRANJIVA ROXBURGHII | 387 |
| | Leaves rough on upper surface, covered with silvery hairs beneath ; twigs not drooping. . . . . . . . . . . . . . . . . . | TREMA ORIENTALIS | 393 |
| 95 | 3 or more leaves springing from the same level on the stem and arranged regularly round the stem (i.e. leaves in whorls). . . . . . . . . . | **96** | |
| | Less than 3 leaves springing from the same level on the stem or leaves not arranged regularly round the stem (i.e. leaves not in whorls). . . | **100** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| | **LEAVES SIMPLE, ENTIRE, WHORLED** | | |
| 96 | Flowers mauve, pink, or pale blue. . . . . . . . . . . . . . . | **97** | |
| | Flowers white, or greenish-white. . . . . . . . . . . . . . . | **98** | |
| 97 | Flowers mauve or pale blue ; leaves less than twice as long as wide. . . | TECTONA HAMILTONIANA | 351 |
| | Flowers pale pink, or white minutely striped with red ; leaves about 3 times as long as wide. . . . . . . . . . . . . . . . . . | OCHROCARPUS LONGIFOLIUS | 31 |
| 98 | Flowers 2″ wide or more. . . . . . . . . . . . . . . . | GARDENIA FLORIDA | 280 |
| | Flowers less than 1″ wide. . . . . . . . . . . . . . . . | **99** | |
| 99 | Leaves mostly in whorls of 4 or more, not more than 9″ long. . . . . | ALSTONIA SCHOLARIS | 310 |
| | Leaves mostly in whorls of 3, up to 12″ long. . . . . . . . . . . . | ALSTONIA MACROPHYLLA | 312 |
| 100 | Leaves arranged in pairs on opposite sides of stem. . . . . . . . | **101** | |
| | Leaves not arranged in pairs on opposite sides of stem. . . . . . . | **134** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| | **LEAVES SIMPLE, ENTIRE, OPPOSITE** | | |
| 101 | Flowers minute, in the *interior* of small fleshy "receptacles" resembling berries. (Figs). . . . . . . . . . . . . . . . . . | FICUS HISPIDA | 416 |
| | Flowers not confined inside receptacles. . . . . . . . . . . . . | **102** | |
| 102 | Leaves less than 2" long. . . . . . . . . . . . . . . . . . . . | **103** | |
| | Leaves more than 2" long. . . . . . . . . . . . . . . . . . . . | **104** | |
| 103 | Leaves pointed at the base ; leaf-stalks very short. . . . . . . . | LAWSONIA INERMIS | 263 |
| | Leaves rounded at the base ; leaf-stalks at least ½" long. . . . . . | SYZYGIUM UNIFLORA | 238 |
| 104 | Flowers small, orange, yellow, or whitish, forming more or less spherical heads ½" to 2" wide. . . . . . . . . . . . . . . . . . | **105** | |
| | Flowers not in compact heads. . . . . . . . . . . . . . . . . . | **107** | |
| 105 | Flowers orange or yellow. . . . . . . . . . . . . . . . . . . . | **106** | |
| | Flowers white or greenish-white. . . . . . . . . . . . . . . . . | MORINDA CITRIFOLIA | 276 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **106** | Flower-heads about 2″ wide ; leaves at least twice as long as broad. | ANTHOCEPHALUS INDICUS | 273 |
| | Flower-heads ½″ to 1″ wide ; leaves less than twice as long as broad. | NAUCLEA ORIENTALIS | 275 |
| **107** | Male and female flowers on separate trees ; males in pendulous catkin-like spikes ; females green, without sepals or petals. | TREWIA NUDIFLORA | 375 |
| | Flowers not in pendulous catkin-like spikes ; flowers either with petals or minute. | **108** | |
| **108** | Flowers at least ½″ wide. | **109** | |
| | Flowers not more than ⅓″ wide. | **126** | |
| **109** | Flowers pale pink, or white minutely striped with red, about 2/3″ across ; leaves about 3 times as long as wide. | OCHROCARPUS LONGIFOLIUS | 31 |
| | Flowers not pale pink. | **110** | |
| **110** | Flowers white or whitish. | **111** | |
| | Flowers not whitish. | **119** | |
| **111** | Stamens 2 only ; flowers white with an orange throat. | NYCTANTHES ARBOR-TRISTIS | 299 |
| | Stamens more than 2 ; flowers not with an orange throat. | **112** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **112** | Stamens 5, concealed by the petals or inconspicuous. . . . . . . . | **113** | |
| | Stamens more than 5, conspicuous. . . . . . . . . . . . . . . | **116** | |
| **113** | Leaves about 4 times as long as wide. . . . . . . . . . . . . | **114** | |
| | Leaves normally less than 3 times as long as wide. . . . . . . . | **115** | |
| **114** | Tube formed by petals over ½" long; petals overlapping one another in bud. . . . . . . . . . . . . . . . . . | ERVATAMIA DIVARICATA | 306 |
| | Tube formed by petals less than ¼" long; petals not overlapping in bud. | WRIGHTIA TINCTORIA | 313 |
| **115** | Flowers at east 2" wide; petals many (flowers "double"). . . . . | GARDENIA FLORIDA | 280 |
| | Flowers less than 1½" wide. . . . . . . . . . . . . . . . | HOLARRHENA ANTIDYSENTERICA | 308 |
| **116** | Leaves smooth and hairless. . . . . . . . . . . . . . . . . | **117** | |
| | Leaves minutely hairy and rough with prominent nerves on the lower surface. . . . . . . . . . . . . . . . . . | PSIDIUM GUAJAVA | 244 |
| **117** | Leaves rounded at the tip; flowers about 1" wide. . . . . . . . | CALOPHYLLUM INOPHYLLUM | 33 |
| | Leaves more or less pointed; flowers about 2" wide or wider. . . . | **118** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **118** | Flowers at ends of branches, 2″ to 3″ wide ; fruit not flattened. . . . | SYZYGIUM JAMBOS | 238 |
| | Flowers in clusters along branches, about 2″ wide ; fruit flattened at base. | SYZYGIUM SAMARENGENSE | 239 |
| **119** | Flowers yellow, brown, or reddish. . . . . . . . . . . . . . . . . | **120** | |
| | Flowers mauve, lilac, or purplish. . . . . . . . . . . . . . . . . | **124** | |
| **120** | Leaves covered with fine down beneath ; leaf-stalks about ¼″ long. . . | WRIGHTIA TOMENTOSA | 316 |
| | Leaves not downy beneath, *or* leaf-stalks at least 2″ long. . . . . | **121** | |
| **121** | Flowers crimson, reddish, or deep pink. . . . . . . . . . . . . . | **122** | |
| | Flowers yellowish. . . . . . . . . . . . . . . . . . . . . . | **123** | |
| **122** | Leaves not more than twice as long as broad ; stamens 5. . . . . . | WRIGHTIA COCCINEA | 315 |
| | Leaves more than twice as long as broad ; stamens very numerous and conspicuous. . . . . . . . . . . . . . . . . . . . . . | SYZYGIUM MALACCENSE | 241 |
| **123** | Flowers yellow and brown ; leaves less than twice as long as broad ; leaf-stalk 3″ to 5″ long. . . . . . . . . . . . . . . . . . . | GMELINA ARBOREA | 353 |
| | Flowers yellow or yellow tinged with pink ; leaves more than twice as long as broad. . . . . . . . . . . . . . . . . . . . . . | GARCINIA COWA | 30 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **124** | Flowers with 5 lobes ; stamens joined to a fleshy column in the centre of the flower. . . . . | CALOTROPIS GIGANTEA | 318 |
| | Petals 6 or more. . . . . | **125** | |
| **125** | Leaves up to 10″ long ; flowers about 2″ wide, purplish-blue or cerise ; flowers mostly in the hot weather. . . . . | LAGERSTROEMIA SPECIOSA | 260 |
| | Leaves not more than 6″ long ; flowers 1″ to 1½″ wide, mauve fading to white ; flowers mostly in the rains. . . . . | LAGERSTROEMIA THORELLII | 262 |
| **126** | Leaves at least 1 foot long. . . . . | TECTONA GRANDIS | 350 |
| | Leaves less than 1 foot long. . . . . | **127** | |
| **127** | Flowers pink, about ¼″ wide. . . . . | CRATOXYLON COCHINCHINENSE | 28 |
| | Flowers white or yellowish. . . . . | **128** | |
| **128** | Stamens 5 in each flower. . . . . | **129** | |
| | Stamens more than 5 in each flower. . . . . | **131** | |
| **129** | Leaves nearly as broad as long ; fruit spherical, about 1½″ wide. . . . . | STRYCHNOS NUX-VOMICA | 321 |
| | Leaves much longer than broad ; fruit less than 1″ wide. . . . . | **130** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 130 | Flowers in hanging spikes ; leaf-stalks at least ¼" long. . . . . . | CITHAREXYLUM QUADRANGULARE | 357 |
| | Flowers in broad clusters ; leaf-stalks very short or none. . . . . . | IXORA PARVIFLORA | 282 |
| 131 | Stamens more than 10 ; flowers white or whitish. . . . . . . . | SYZYGIUM CUMINI | 242 |
| | Stamens not more than 10 ; pairs of leaves often not quite opposite. . . | **132** | |
| 132 | Stamens 9 ; leaves with 3 conspicuous veins joining at the base of the leaf ; a medium-sized tree. . . . . . . . . . . . . . . . . . | CINNAMOMUM TAMALA | 362 |
| | Stamens 10 ; leaves with 1 principal central vein and many smaller veins branching from it ; tall trees. . . . . . . . . . . . . . . . | **133** | |
| 133 | Leaf-stalks over ½" long ; fruit pear-shaped, not winged. . . . . . | TERMINALIA CHEBULA | 232 |
| | Leaf-stalks less than ½" long ; fruit with 5 wings. . . . . . . . . | TERMINALIA ARJUNA | 234 |
| 134 | Flowers minute, combined inside or outside hard or fleshy masses resembling fruits. . . . . . . . . . . . . . . . . . . . | **135** | |
| | Flowers not combined in solid, hard or fleshy masses. . . . . . . | **146** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| | **FIGS, JACK-FRUIT** | | |
| 135 | Flowers in the interior of small, fleshy "receptacles" which resemble berries. (Fig-trees). | **136** | |
| | Flowers crowded on the outside of hard heads which are from 1" to 30" long. (Jack-fruit, etc.). | **145** | |
| 136 | Receptacles (figs) on trunk and larger branches. | **137** | |
| | Receptacles on small branches and twigs. | **138** | |
| 137 | Leaves over 8" long, almost as broad as long. | FICUS AURICULATA | 417 |
| | Leaves less than 8" long, at least twice as long as wide. | FICUS GLOMERATA | 419 |
| 138 | Leaves smooth and shining, up to 10" long, at least twice as long as wide. | FICUS ELASTICA | 406 |
| | Leaves less than 7" long. | **139** | |
| 139 | Leaves rough on the upper surface. | FICUS HISPIDA | 416 |
| | Leaves smooth on the upper surface. | **140** | |
| 140 | Leaves heart-shaped with a pronounced tail or projecting point at the tip. | **141** | |
| | Leaves not heart-shaped with a pronounced tail at the tip. | **142** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **141** | Tail about ¼ the length of the whole leaf; leaf with about 8 pairs of nerves spreading from the central nerve. | FICUS RELIGIOSA | 410 |
| | Tail about 1/6 the length of the whole leaf; leaf with 3 to 6 pairs of nerves spreading from the central nerve. | FICUS RUMPHII | 409 |
| **142** | Leaf-stalks at least 1″ long. | **143** | |
| | Leaf-stalks less than 1″ long. | **144** | |
| **143** | Leaves at least twice as long as broad; edges of leaves wavy. | FICUS INFECTORIA | 407 |
| | Leaves less than twice as long as broad; edges of leaves not wavy. | FICUS BENGALENSIS | 413 |
| **144** | Leaves usually ending in a tapering point; a large spreading tree with drooping branches; receptacles up to ¾″ wide. | FICUS COMOSA | 404 |
| | Leaves not ending in a tapering point; a medium-sized tree; receptacles less than ½″ wide. | FICUS RETUSA | 405 |
| **145** | Flowers in cylindrical heads often borne on the trunk; female heads up to 30″ long when ripe. | ARTOCARPUS INTEGRA | 399 |
| | Flowers in spherical or lobed heads borne on the smaller branches; heads not more than 3″ long. | ARTOCARPUS LAKOOCHA | 401 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| | **LEAVES SIMPLE, ENTIRE, ALTERNATE OR SCATTERED** | | |
| 146 | Young leaves enclosed in pinkish sheaths which are 4" to 8" long and fall as soon as the leaves open ; mature leaves up to 10" long, pointed, shining ; flowers minute, in the interior of small berry-like figs which appear during the rains. | FICUS ELASTICA | 406 |
| | Young leaves not enclosed in large pinkish sheaths ; flowers not in the interior of small figs. | **147** | |
| 147 | Flowers large, pinkish, borne only on short leafless branches at the base of the stout trunk. | COUROUPITA GUIANENSIS | 257 |
| | Flowers not on short leafless branches springing only from the base of the trunk. | **148** | |
| 148 | Flowers minute, yellow, forming dense cylindrical spikes 1½" to 3" long. | ACACIA MONILIFORMIS | 209 |
| | Flowers not minute and yellow forming cylindrical spikes. | **149** | |
| 149 | Leaf-stalks with 2 opposite green wings looking like a small leaf at the base of the main leaf. | CITRUS *SPEC.* | 76 |
| | Leaf-stalks not winged. | **150** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 150 | Leaves silvery-white beneath, 5" to 8" long ; flowers pinkish, ¼" wide. | HERITIERA LITTORALIS | 53 |
| | Leaves not silvery-white beneath. | **151** | |
| 151 | Flowers small and numerous with prominent stamens forming stiff, brush-like spikes near the ends of the branches ; leaves narrow. | **152** | |
| | Flowers not with prominent stamens forming cylindrical brush-like spikes. | **153** | |
| 152 | Flowers red ; leaves about 2" long by 1/5" wide. | CALLISTEMON LANCEOLATUS | 249 |
| | Flowers whitish ; leaves up to 4" long by 1" wide. | MELALEUCA LEUCADENDRON | 246 |
| 153 | Leaves less than ½" wide. | **154** | |
| | Leaves not less than ½" wide, or, if narrower, less than 1" long. | **157** | |
| 154 | Leaves at least 2" long. | **155** | |
| | Leaves less than 1" long. | **156** | |
| 155 | Leaves leathery, very dark green above ; flowers minute. | PODOCARPUS MACROPHYLLA | 480 |
| | Leaves not leathery, bright green, shining ; flowers 2" wide. | THEVETIA PERUVIANA | 302 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 156 | Flowers about ½″ wide and long, orange ; leaves mostly in pairs springing from the same point on the stem. . . . . . . . . . . . . . . . . | BRYA EBENUS | 162 |
| | Flowers about ¼″ wide, greenish ; leaves narrow, in 2 opposite rows. . | EMBLICA OFFICINALIS | 385 |
| 157 | Leaves narrow, about 5″ long by 1″ broad, or longer. . . . . . . . | **158** | |
| | Leaves not more than 4 times as long as broad. . . . . . . . . . | **160** | |
| 158 | Flowers small, yellowish, in stiff, erect, branched clusters at the ends of the branches, scented. . . . . . . . . . . . . . . . . . . | MANGIFERA INDICA | 134 |
| | Flowers not in clusters at the ends of the branches. . . . . . . . . | **159** | |
| 159 | Leaves with wavy edges ; flowers about 1″ wide, greenish, thickly clustered along and close to the branches. . . . . . . . . . . . . . . | POLYALTHIA LONGIFOLIA | 9 |
| | Leaves scented when crushed, with straight edges ; a graceful tree with scanty foliage ; flowers inconspicuous. . . . . . . . . . . . . . | EUCALYPTUS CITRIODORA | 246 |
| 159A | Leaves about 1¾″ long, ending in a sharp spine ; flowers orange. . . | JACQUINEA RUSCIFOLIA | 285 |
| | Leaves not ending in a sharp spine. . . . . . . . . . . . . | **160** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 160 | Leaves in clusters of 3 to 6 all springing from the same point ; a small spreading tree ; fruit up to 10" wide. | CRESCENTIA CUJETE | 348 |
| | Leaves not in clusters springing from the same point. | **161** | |
| 161 | Leaves mostly over 5" long, narrow, arranged near ends of thick, pale-coloured branches ; juice milky ; flowers 1" to 2" wide, scented ; petals white, red, or yellow. | **162** | |
| | Leaves not clustered at the ends of thick, pale-coloured branches. | **163** | |
| 162 | Calyx-segments about 1" long. | CERBERA ODOLLAM | 302 |
| | Calyx-segments less than ¼" long. | PLUMERIA *SPEC.* | 304 |
| 163 | Petals 3 ; flowers greenish-white, 1" wide or wider. | **164** | |
| | Petals more than 3, or flowers less than ½" wide. | **165** | |
| 164 | Flowers 2 or 3 together ; leaves 5" to 8" long. | ANONA RETICULATA | 14 |
| | Flowers solitary ; leaves 2" to 3" long. | ANONA SQUAMOSA | 12 |
| 165 | Flowers more than 1¼" wide. | **166** | |
| | Flowers not more than 1" wide. | **175** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 166 | Flowers orange. | CORDIA SEBESTENA | 325 |
| | Flowers not orange. | **167** | |
| 167 | Leaves at least twice as long as wide. | **168** | |
| | Leaves less than twice as long as wide. | **174** | |
| 168 | Flowers pink, about 3″ wide; leaves up to 20″ long. | GUSTAVIA AUGUSTA | 256 |
| | Flowers white or yellow. | **169** | |
| 169 | Flowers white. | **170** | |
| | Flowers yellow. | **173** | |
| 170 | Leaves brown beneath; flowers over 3″ wide. | MAGNOLIA GRANDIFLORA | 3 |
| | Leaves not brown beneath. | **171** | |
| 171 | Leaves covered with whitish down beneath. | PTEROSPERMUM LANCEAEFOLIUM | 59 |
| | Leaves not covered with down beneath. | **172** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 172 | Leaves narrow ; petals and sepals totalling 15 ; flowers about 2″ wide. | MICHELIA CHAMPACA *VAR.* ALBA | 6 |
| | Leaves broad ; sepals 3 ; petals 6 ; flowers over 2″ wide. . . . . . | MAGNOLIA PTEROCARPA | 4 |
| 173 | Flowers over 2″ wide ; petals and sepals totalling 15. . . . . . . | MICHELIA CHAMPACA | 5 |
| | Flowers over 3″ wide ; petals 6. . . . . . . . . . . . . . . . | CANANGA ODORATA | 11 |
| 174 | Flowers white, pink, or purple ; fruit prickly. . . . . . . . . . | BIXA ORELLANA | 18 |
| | Flowers yellow fading to purplish ; fruit not prickly. . . . . . . | HIBISCUS POPULNEUS | 39 |
| 175 | Flowers miuute, in small globular heads. . . . . . . . . . . . | **176** | |
| | Flowers not in small globular heads. . . . . . . . . . . . . . | **177** | |
| 176 | Heads of flowers ½″ to ¾″ wide ; leaves 1″ to 3″ long ; a large tree. . . | ANOGEISSUS ACUMINATA | 236 |
| | Heads not more than ⅓″ wide ; leaves less than 2″ long ; a small tree or shrub. . . . . . . . . . . . . . . . . . . | ANOGEISSUS PENDULA | 235 |
| 177 | Leaves covered with dense woolly down ; flowers white, about ½″ across ; berries yellow. . . . . . . . . . . . . . . . . . . . | SOLANUM VERBASCIFOLIUM | 328 |
| | Leaves not covered with dense woolly down. . . . . . . . . . . | **178** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **178** | Flowers at least ½" wide or long. | **179** | |
| | Flowers less than ½" wide or long. | **188** | |
| **179** | Sepals 3 ; petals 3, or 6 in 2 whorls of 3 each. | **180** | |
| | Petals or lobes of the flower 4, 5, or 6 in one whorl, not in whorls or 3. | **181** | |
| **180** | Petals reddish-brown. | POLYALTHIA SUBEROSA | 7 |
| | Petals greenish | POLYALTHIA CERASOIDES. | 8 |
| **181** | Flowers white or whitish. | **181*A*** | |
| | Flowers purplish or brownish. | **181*B*** | |
| **181A** | Leaf-stalks mostly at least 2" long. | BERRIA CORDIFOLIA | 68 |
| | Leaf-stalks not more than 1½" long. | **182** | |
| **181B** | Flowers purplish or brownish ; leaves nearly as broad as long. | PTERYGOTA ALATA | 50 |
| | Flowers pinkish ; leaves about twice as long as broad. | ARDISIA SOLANACEA | 284 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 182 | Leaves about 8″ long by 2″ broad, shining above; male and female flowers on separate trees. | **183** | |
| | Leaves less than 6″ long. | **184** | |
| 183 | Leaves silky below; flowers about ½″ wide; fruit velvety, brownish when ripe. | DIOSPYROS DISCOLOR | 298 |
| | Leaves not silky below; flowers about 1″ wide; fruit not velvety, yellowish when ripe. | DIOSPYROS PEREGRINA | 294 |
| 184 | Flowers fleshy, about ⅔″ long, cream-coloured; leaves about 5″ long by 3″ wide. | MADHUKA LATIFOLIA | 291 |
| | Flowers not fleshy; leaves less than 5″ long. | **185** | |
| 185 | Flowers at least as long as wide. | **186** | |
| | Flowers more or less flat. | **187** | |
| 186 | Flowers bell-shaped, about ½″ wide, with 6 lobes. | ACHRAS ZAPOTA | 287 |
| | Flowers not bell-shaped; petals 5 to 10, separate, downy outside. | ALANGIUM SALVIFOLIUM | 270 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **187** | Flowers pure white or pinkish ; stamens partially united and forming a short tube. | CITRUS *SPEC.* | 76 |
| | Flowers neither pinkish nor pure white ; stamens spreading, not forming a tube. | MIMUSOPS ELENGI | 288 |
| **188** | Flowers pink, brownish, or reddish. | **189** | |
| | Flowers white, yellowish, or greenish. | **190** | |
| **189** | Flowers pink, about ¼″ wide, in large conspicuous clusters. | KLEINHOVIA HOSPITA | 55 |
| | Flowers minute, brownish-red, in small clusters. | CICCA ACIDA | 383 |
| **190** | Flowers only at the ends of the twigs, in conspicuous spikes or clusters projecting beyond the leaves. | **191** | |
| | Flowers arranged among the leaves or along the branches, not confined to the tips of the twigs. | **194** | |
| **191** | Flowers yellowish, scented, in stiff, erect, branching clusters, which are at least 4″ long ; leaves more than 3 times as long as broad. | MANGIFERA INDICA | 134 |
| | Flowers in clusters less than 4″ long (but sometimes more than 4″ broad) ; leaves less than 3 times as long as broad. | **192** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 192 | Flowers minute, in dense, stiff spikes; leaves broad, with long tapering points. | SAPIUM SEBIFERUM | 380 |
| | Flowers about ¼" wide, in open clusters; leaves not with tapering points | **193** | |
| 193 | Leaf-stalks about 2" long; a tall scrambling shrub. | MALLOTUS REPANDUS | 366 |
| | Leaf-stalks less than 1" long; a spreading tree. | MOQUILEA PYRIFOLIA | 226 |
| 194 | Flowers minute, in compact, catkin-like spikes ½" to 2" long; twigs and leaves full of poisonous milky juice. | EXCAECARIA AGALLOCHA | 382 |
| | Flowers not in compact spikes; sap not milky. | **195** | |
| 195 | Leaves less than 3" long. | **196** | |
| | Leaves mostly more than 3" long. | **197** | |
| 196 | Flowers solitary or in small short clusters. | DIOSPYROS CHLOROXYLON | 296 |
| | Flowers in stiff, branched spikes. | ANTIDESMA GHAESEMBILLA | 388 |
| 197 | Leaves strongly aromatic when rubbed, smelling of camphor, waxy beneath. | CINNAMOMUM CAMPHORA | 363 |
| | Leaves not strongly aromatic when rubbed. | **198** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **198** | Leaves usually slightly aromatic when rubbed ; flowers minute, 4 to 6 joined in small heads about ¼" wide, which resemble separate flowers ; male and female flowers on separate trees. . . . . . . . . . . . . . . . | **199** | |
| | Leaves not aromatic ; flowers not joined in heads resembling separate flowers. . . . . . . . . . . . . . . . . . . . . . | **200** | |
| **199** | Leaves pale beneath. . . . . . . . . . . . . . . . . . . . . | LITSAEA CHINENSIS | 359 |
| | Leaves covered with brownish down beneath. . . . . . . . . . | LITSAEA MONOPETALA | 360 |
| **200** | Flowers in narrow spikes or clusters among the leaves at the ends of the branches ; stamens 10 in each flower. . . . . . . . . . . . . . . . . | **201** | |
| | Flowers scattered along the branches, or in broad, open clusters ; stamens more or less than 10, or none. . . . . . . . . . . . . . . . . . . | **204** | |
| **201** | Flowers in small unbranched spikes ; leaves not in opposite pairs. . . | **202** | |
| | Flowers in branched clusters ; leaves usually in nearly opposite pairs. . | **203** | |
| **202** | Flowers white ; fruit about 2" long. . . . . . . . . . . . . . . . . . | TERMINALIA CATAPPA | 228 |
| | Flowers greenish-yellow ; fruit about 1" long. . . . . . . . . . . . | TERMINALIA BELERICA | 230 |
| **203** | Leaf-stalks over ½" long ; fruit without wings. . . . . . . . . . . . | TERMINALIA CHEBULA | 232 |
| | Leaf-stalks less than ½" long ; fruit with 5 wings. . . . . . . . . . | TERMINALIA ARJUNA | 234 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **204** | Leaf-stalks less than ½″ long ; flowers scattered along the branches. . . | **205** | |
| | Leaf-stalks at least 1″ long ; flowers in branching clusters. . . . . . | CORDIA DICHOTOMA | 323 |
| **205** | Leaves hairless, shining, not recessed at the base. . . . . . . . | **206** | |
| | Leaves downy, recessed at the base. . . . . . . . . . . . . . | DIOSPYROS CORDIFOLIA | 293 |
| **206** | Twigs pendulous. . . . . . . . . . . . . . . . . . . . | PUTRANJIVA ROXBURGHII | 387 |
| | Twigs not pendulous. . . . . . . . . . . . . . . . . . . | GELONIUM MULTIFLORUM | 379 |
| **207** | Leaflets 3 per leaf. . . . . . . . . . . . . . . . . . . | **208** | |
| | Leaflets more than 3 per leaf. . . . . . . . . . . . . . . | **217** | |
| | **LEAVES TRIFOLIOLATE** | | |
| **208** | Flowers minute, green ; leaflets dark green, shining, with notched edges. | BISCHOFIA JAVANICA | 390 |
| | Flowers at least ¼″ wide, not green. . . . . . . . . . . . . | **209** | |
| **209** | Flowers not more than ½″ wide or long, usually bluish, in long clusters at the ends of the twigs. . . . . . . . . . . . . . . . . . . | **210** | |
| | Flowers not less than ¾″ long or wide, never bluish. . . . . . . | **211** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **210** | Leaflets pointed. | VITEX NEGUNDO | 355 |
| | Leaflets blunt. | VITEX TRIFOLIA | 356 |
| **211** | Flowers white. | **212** | |
| | Flowers not white. | **214** | |
| **212** | Flowers in dense spikes or clusters. | ERYTHRINA INDICA *VAR.* ALBA | 158 |
| | Flowers not in dense spikes or clusters. | **213** | |
| **213** | Flowers about 1¼″ wide; branches usually thorny; fruit spherical, over 2″ wide. | AEGLE MARMELOS | 93 |
| | Flowers about 2″ wide, borne on the trunk and larger branches; fruit cylindrical, over 3″ long. | PARMENTERIA CERIFERA | 344 |
| **214** | Flowers yellow with dark purplish stamens. | CRATAEVA ROXBURGHII | 15 |
| | Flowers red. | **215** | |
| **215** | Flower-stalks velvety-brown; leaves silky beneath. | BUTEA MONOSPERMA | 160 |
| | Flower-stalks not velvety-brown; leaves smooth and hairless; small, soft-wooded trees. | **216** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 216 | Leaflets as broad as long. | ERYTHRINA INDICA | 157 |
| | Leaflets about twice as long as broad. | ERYTHRINA OVALIFOLIA | 158 |
| 217 | Leaflets all spreading outwards from the end of the leaf-stalk. | **218** | |
| | Leaflets arranged on either side of a central midrib or "rachis". | **223** | |
| | **LEAVES DIGITATE** | | |
| 218 | Flowers over 2″ long, bright yellow; petals joined into a funnel-shaped tube. | TABEBUIA *SPEC.* | 331 |
| | Flowers not bright yellow; petals not joined into a tube. | **219** | |
| 219 | Flowers over 2″ wide. | **220** | |
| | Flowers less than 2″ wide. | **221** | |
| 220 | Flowers red (or occasionally yellowish or whitish); flower-stalks short or absent. | SALMALIA MALABARICA | 43 |
| | Flowers white, hanging on long stalks. | ADANSONIA DIGITATA | 45 |
| 221 | Flowers less than ½″ long, usually bluish, in long clusters at the ends of the twigs. | VITEX NEGUNDO | 355 |
| | Flowers not blue or white, or if white more than 1″ long. | **222** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 222 | Flowers yellowish-red, about ½″ wide, with an offensive smell. . . . | STERCULIA FOETIDA | 47 |
| | Flowers yellowish-white, about 1¼″ long. . . . . . . . . . . | CEIBA PENTANDRA | 41 |
| 223 | Midrib of leaf unbranched; leaflets in 2 rows, all springing from the midrib. . . . . . . . . . . . . . . . . . . | 224 | |
| | Midrib with lateral branches which bear leaflets; leaflets in more than 2 rows. . . . . . . . . . . . . . . . . . . | 286 | |
| 224 | Midrib with a terminal leaflet; number of leaflets usually odd. . . . . | 225 | |
| | Midrib without a terminal leaflet; number of leaflets usually even. . . | 254 | |
| | **LEAVES IMPARIPINNATE** | | |
| 225 | Midrib of leaf with a leafy wing on either side between the leaflets. . | FILICIUM DECIPIENS | 117 |
| | Midrib of leaf not winged between the leaflets; or wing less than ⅛″ wide. . . . . . . . . . . . . . . . . . . | 226 | |
| 226 | Leaflets deeply divided into narrow pointed lobes, silvery-grey beneath. | GREVILLEA ROBUSTA | 365 |
| | Leaflets not deeply divided into narrow pointed lobes, not silvery-grey beneath. . . . . . . . . . . . . . . . . . . | 227 | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 227 | Edges of leaflets toothed, notched, saw-like, or shallowly lobed. . . . | **228** | |
| | Edges of leaflets smooth, neither toothed, notched, nor lobed. . . . | **234** | |
| 228 | Lateral leaflets in opposite pairs. . . . . . . . . . . . . . . . . | **229** | |
| | Lateral leaflets not in opposite pairs. . . . . . . . . . . . . . . | **232** | |
| 229 | Flowers only at the ends of the twigs, appearing with or before the new leaves. . . . . . . . . . . . . . . . . . . . | **230** | |
| | Flowers appearing among mature leaves. . . . . . . . . . . . . | **231** | |
| 230 | Flowers yellow ; leaflets up to 6″ long ; fruit black when ripe. . . . | GARRUGA PINNATA | 99 |
| | Flowers greenish-white ; leaflets not more than 3½″ long ; fruit yellow when ripe. . . . . . . . . . . . . . . . . . . . | SPONDIAS DULCIS | 133 |
| 231 | Flowers white, less than ½″ long ; leaflets more than 7. . . . . . . | AZADIRACHTA INDICA | 101 |
| | Flowers yellow, more than 1″ long ; leaflets 5 or 7. . . . . . . . | TECOMA STANS | 335 |
| 232 | Leaflets mostly over 1½″ long, coarsely toothed or lobed. . . . . . | **233** | |
| | Leaflets not more than 1½″ long, minutely toothed. . . . . . . . | MURRAYA KOENIGII | 74 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 233 | Leaflets 1″ to 3″ long, smooth and hairless; flowers sweet-scented. | AZADIRACHTA INDICA | 101 |
| | Leaflets 4″ to 6″ long, hairy; flowers not sweet-scented. | AILANTHUS EXCELSA | 95 |
| 234 | Branches thorny; fruit spherical, at least 2″ wide when ripe; leaflets not more than 7. | **235** | |
| | Branches not thorny; fruit not spherical, *or* less than 2″ wide. | **236** | |
| 235 | Leaflets usually 3, occasionally 5; flowers over 1″ wide, greenish-white. | AEGLE MARMELOS | 93 |
| | Leaflets 5 to 7; flowers about ½″ wide, usually reddish. | FERONIA LIMONIA | 90 |
| 236 | Lateral leaflets not arranged in opposite pairs. | **236*A*** | |
| | Lateral leaflets in opposite or nearly opposite pairs. | **243** | |
| 236A | Leaflets usually 7 or 9, up to 3½″ long, shining, with wavy margins and a small blunt point at the apex ending in a small notch. | MYROXYLON PEREIRAE | 141 |
| | Leaflets not with wavy margins. | **237** | |
| 237 | Flowers white. | **238** | |
| | Flowers not white. | **239** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 238 | Flowers about 1" long ; leaflets 4 to 9. | MURRAYA PANICULATA | 73 |
| | Flowers about ⅓" long ; leaflets 10 to 21. | MURRAYA KOENIGII | 74 |
| 239 | Flowers orange or golden-yellow. | PTEROCARPUS INDICUS | 151 |
| | Flowers neither orange nor bright yellow. | **240** | |
| 240 | Leaflets 11 or more ; flowers pink, mauve, or reddish. | **241** | |
| | Leaflets less than 11 ; flowers yellowish or cream-coloured. | **242** | |
| 241 | Flowers about ¼" long, pink or mauve. | DALBERGIA LANCEOLARIA | 155 |
| | Flowers very small in dense clusters, reddish-brown or pink. | CICCA ACIDA | 383 |
| 242 | Leaflets 3 to 5, pointed. | DALBERGIA SISSOO | 152 |
| | Leaflets 3 to 7, blunt. | DALBERGIA LATIFOLIA | 154 |
| 243 | Flowers at least 1½" long. | **244** | |
| | Flowers less than 1½" long. | **246** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 244 | Flowers red or orange. . . . . . . . . . . . . . . . . . . . | **244A** | |
| | Flowers white or yellowish-brown. . . . . . . . . . . . . . . . | **245** | |
| 244A | Flowers about 4" long. . . . . . . . . . . . . . . . . . . . | SPATHODEA CAMPANULATA | 338 |
| | Flowers less than 2" long. . . . . . . . . . . . . . . . . . . | CASTANOSPERMUM AUSTRALE | 164 |
| 245 | Flowers white, over 4" long. . . . . . . . . . . . . . . . . . | DOLICHANDRONE SPATHACEA | 337 |
| | Flowers yellowish-brown, less than 4" long. . . . . . . . . . . . | HETEROPHRAGMA ADENOPHYLLUM | 340 |
| 246 | Flowers shaped like a pea-flower (i.e. with 5 petals, of which the 2 lowest are more or less joined to form a keel or beak and are enclosed by the 2 lateral, the fifth and upper petal usually being bent back). . . . . | **247** | |
| | Flowers not shaped like a pea-flower. . . . . . . . . . . . . . . | **250** | |
| 247 | Flowers about ¼" long, pale purple ; leaflets 7. . . . . . . . . . | MILLETTIA OVALIFOLIA | 145 |
| | Flowers more than ¼" long. . . . . . . . . . . . . . . . . . . | **248** | |
| 248 | Flowers about 1" long ; leaflets usually more than 10. . . . . . . . | GLIRICIDIA MACULATA | 146 |
| | Flowers about ½" long ; leaflets less than 10. . . . . . . . . . . | **249** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 249 | Leaflets at least twice as long as broad. | PISCIDIA ERYTHRINA | 147 |
| | Leaflets less than twice as long as broad. | PONGAMIA PINNATA | 149 |
| 250 | Flowers pink, purplish, or brownish. | **251** | |
| | Flowers white, greenish, or yellowish. | **252** | |
| 251 | Flowers about ¼" wide, pink, or purple and white; leaflets 5 to 11; fruit winged. | AVERRHOA CARAMBOLA | 70 |
| | Flowers about ½" long, brownish-purple; leaflets 11 to 35; fruit not winged. | AVERRHOA BILIMBI | 71 |
| 252 | Flowers white, appearing during the rains; leaves evergreen. | APPANAMIXIS POLYSTACHYA | 105 |
| | Flowers greenish-yellow, appearing with the new leaves, or before them, during the hot season; leaves fall during the cold season. | **253** | |
| 253 | Leaflets 7 to 9; fruit about ¼" wide. | LANNEA GRANDIS | 129 |
| | Leaflets 9 to 13; fruit 1½" to 2" wide when ripe. | SPONDIAS MANGIFERA | 131 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| | **LEAVES PARIPINNATE** | | |
| 254 | Midrib of leaf with leafy wings between the leaflets. . . . . . . . . | FILICIUM DECIPIENS | 117 |
| | Midrib of leaf not winged. . . . . . . . . . . . . . . . . . . | **255** | |
| 255 | Leaflets more than 50, about ½" long by ⅛" wide. . . . . . . . | EMBLICA OFFICINALIS | 385 |
| | Leaflets less than 50, more than ½" long. . . . . . . . . . . . | **256** | |
| 256 | Flowers at least ½" long or wide. . . . . . . . . . . . . . . . | **257** | |
| | Flowers not more than ⅓" long or wide. . . . . . . . . . . . . | **274** | |
| 257 | Flowers about 3" long; leaflets about 40. . . . . . . . . . . . | SESBANIA GRANDIFLORA | 141 |
| | Flowers less than 3" long; leaflets less than 34. . . . . . . . . | **258** | |
| 258 | Flowers about 3" wide, dark purple, in hanging clusters. . . . . . | KIGELIA PINNATA | 346 |
| | Flowers not dark purple in hanging clusters. . . . . . . . . . . . | **259** | |
| 259 | Flowers red, or red and yellow (not pink or purplish). . . . . . . | **260** | |
| | Flowers pink, white or yellow. . . . . . . . . . . . . . . . . | **263** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **260** | Flowers over 2″ wide in hanging clusters. . . . . . . . . . . | AMHERSTIA NOBILIS | 181 |
| | Flowers not in hanging clusters. . . . . . . . . . . . . . . . | **261** | |
| **261** | Leaflets less than 1″ long; flowers yellow striped with red. . . . . | TAMARINDUS INDICA | 183 |
| | Leaflets more than 2″ long. . . . . . . . . . . . . . . . . . | **262** | |
| **262** | Flowers over 1″ long; in compact round clusters about 4″ wide; leaflets about 14. . . . . . . . . . . . . . . . . . . . | BROWNEA COCCINEA | 180 |
| | Flowers less than 1″ long, in small clusters scattered along the branches; leaflets 6 to 12. . . . . . . . . . . . . . . . . . . . | SARACA INDICA | 178 |
| **263** | Flowers yellow. . . . . . . . . . . . . . . . . . . . . | **264** | |
| | Flowers pink or white. . . . . . . . . . . . . . . . . . . | **269** | |
| **264** | Leaflets less than ¼″ wide; flowers shaped like a pea-flower, often striped with red. . . . . . . . . . . . . . . . . . . . | **265** | |
| | Leaflets at least ¼″ wide; flowers not shaped like a pea-flower, not striped with red. . . . . . . . . . . . . . . . . . . . | **266** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 265 | A large tree ; pods swollen. . . . . . . . . . . . . . . . . . . . | TAMARINDUS INDICA | 183 |
| | A shrub or a small short-lived tree ; pods slender. . . . . . . . | SESBANIA SESBAN | 143 |
| 266 | Flowers in hanging clusters ; leaflets up to 6″ long. . . . . . . | CASSIA FISTULA | 188 |
| | Flowers in erect clusters ; leaflets not more than 3″ long. . . . . | **267** | |
| 267 | Leaflets more than 30, not more than ¼″ wide. . . . . . . . . . | CASSIA MULTIJUGA | 197 |
| | Leaflets less than 30, at least ½″ wide. . . . . . . . . . . . . . | **268** | |
| 268 | Leaflets 12 to 28, 2″ to 3″ long ; pod 6″ to 9″ long. . . . . . . | CASSIA SIAMEA | 198 |
| | Leaflets 6 to 18, 1″ to 2″ long ; pod 3″ to 6″ long. . . . . . . . | CASSIA GLAUCA | 199 |
| 269 | Leaflets more than 8 ; flowers more or less pink. . . . . . . . . | **270** | |
| | Leaflets 6 ; flowers white. . . . . . . . . . . . . . . . . . . . . | CYNOMETRA POLYANDRA | 201 |
| 270 | Leaflets 10 to 24 ; flowers 1½″ to 2″ wide. . . . . . . . . . . . | **271** | |
| | Leaflets 14 to 40 ; flowers about 1″ wide. . . . . . . . . . . . . | **272** | |
| 271 | Leaflets pointed, usually at least 2″ long ; flowers April till August. . | CASSIA NODOSA | 190 |
| | Leaflets blunt, less than 2″ long ; flowers mostly in April. . . . . | CASSIA JAVANICA | 192 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 272. | Pod rough, curved, slightly flattened ; flowers February to April in long spikes ; leaflets narrow, round at both ends ; young leaflets usually reddish. | CASSIA GRANDIS | 196 |
| | Pod smooth, straight, cylindrical ; flowers in short clusters ; young leaflets not reddish. | **273** | |
| 273 | Leaflets narrowed at base, unequal-sided, about twice as long as broad ; flowers June/July. | CASSIA MARGINATA | 195 |
| | Leaflets rounded at base, 3 to 4 times as long as broad ; flowers April/May. | CASSIA RENIGERA | 193 |
| 274 | Leaflets less than 1″ long ; flowers very small, yellow, in catkin-like clusters. | HAEMATOXYLON CAMPECHIANUM | 185 |
| | Leaflets more than 2″ long. | **275** | |
| 275 | Leaflets nearly always 4, in 2 opposite pairs, leathery, 3″ to 8″ long, the outer pair the larger. | LEPISANTHES TETRAPHYLIA | 119 |
| | Leaflets usually more than 4 per leaf. | **276** | |
| 276 | Flowers about ¼″ wide, whitish with a red or orange disk inside at the base of the flower. | **277** | |
| | Flowers less than ¼″ wide, without a red or orange disk within. | **279** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 277 | Leaves less than 9″ long; leaflets less than 3″ long. . . . . . . . | SWIETENIA MAHAGONI | 107 |
| | Leaves at least 12″ long; leaflets at least 3″ long. . . . . . . . . | **278** | |
| 278 | Leaves 1 to 3 feet long; leaflets 3″ to 5″ long, light green, often toothed or notched. . . . . . . . . . . . . . . . . . . . . . | CEDRELA TOONA | 110 |
| | Leaves 1 to 2 feet long; leaflets 3″ to 8″ long, dark green above when mature, neither toothed nor notched. . . . . . . . . . . . . . | SWIETENIA MACROPHYLLA | 109 |
| 279 | Leaflets coarsely toothed, saw-edged, or lobed. . . . . . . . . . | **280** | |
| | Leaflets neither toothed, notched, nor lobed. . . . . . . . . . . | **281** | |
| 280 | Leaflets 1″ to 3″ long, hairless; flowers sweet-scented. . . . . . . | AZADIRACHTA INDICA | 101 |
| | Leaflets 4″ to 6″ long, hairy; flowers not sweet-scented. . . . . . | AILANTHUS EXCELSA | 95 |
| 281 | Fruit spherical or egg-shaped, often reddish when ripe, covered with small raised points. . . . . . . . . . . . . . . . . . . . . . | **282** | |
| | Fruit not covered with small raised points. . . . . . . . . . . . | **283** | |
| 282 | Leaflets up to 12″ long; flowers yellowish; fruit less than 1″ wide. . . | EUPHORIA LONGANA | 122 |
| | Leaflets not more than 6″ long; flowers pale green; fruit at least 1″ wide when ripe. . . . . . . . . . . . . . . . . . . . . . | LITCHI CHINENSIS | 124 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 283 | Leaflets in opposite pairs. | 284 | |
| | Leaflets not quite in opposite pairs. | SAPINDUS MUKOROSSI | 127 |
| 284 | Leaflets about 12; fruit about 3″ long. | BLIGHIA SAPIDA | 118 |
| | Leaflets not more than 8; fruit less than 2″ long. | 285 | |
| 285 | Flowers yellowish or greenish; fruits separate. | SCHLEICHERA OLEOSA | 121 |
| | Flowers white; fruits roundish, partially joined in groups of 2 or 3. | SAPINDUS LAURIFOLIUS | 126 |
| 286 | Leaflets springing direct from the branches of the midrib of the leaf (i.e. leaves bipinnate). | 287 | |
| | Leaflets springing from subdivisions of the branches of the midrib (i.e. leaves tripinnate). | 312 | |

(*N.B.*—The branches of the midrib of a compound leaf are known as "pinnae", by which name they will be referred to in the remainder of this key.)

## LEAVES BIPINNATE

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 287 | Flowers less than ¼″ wide, densely clustered in heads or spikes; stamens long and prominent. | 288 | |
| | Flowers at least ¼″ wide, seldom clustered in heads or spikes; stamens not the most conspicuous part of the flower. | 298 | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| **288** | Flowers pink. | ENTEROLOBIUM SAMAN | 224 |
| | Flowers yellow, white, or greenish. | **289** | |
| **289** | Flowers bright yellow, in spherical heads about ½″ wide. | **290** | |
| | Flowers not bright yellow. | **291** | |
| **290** | Twigs conspicuously zig-zag; flowers scented. | VACHELLIA FARNESIANA | 214 |
| | Twigs almost straight; flowers not scented. | ACACIA ARABICA | 212 |
| **291** | Flowers in heads about 1″ wide, scented; pinnae 4 to 6; leaflets 8 to 18 in each pinna. | ALBIZZIA LEBBEK | 219 |
| | Flowers in heads less than 1″ wide. | **292** | |
| **292** | Pinnae not more than 4; leaflets not more than 8 in each pinna. | **293** | |
| | Pinnae more than 4. | **294** | |
| **293** | Pinnae 2; leaflets 2 (i.e. leaflets 4 in each leaf). | PITHECOLOBIUM DULCE | 222 |
| | Pinnae 2 or 4; leaflets usually 4 or 6 (i.e. leaflets more than 4 in each leaf) | ALBIZZIA LUCIDA | 216 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 294 | Leaflets more than ¼″ wide. | **295** | |
| | Leaflets less than ⅛″ wide. | **296** | |
| 295 | Leaflets in opposite pairs; flowers in numerous small heads. | ALBIZZIA PROCERA | 217 |
| | Leaflets not in opposite pairs; flowers in slender spikes. | ADENANTHERA PAVONINA | 206 |
| 296 | Leaflets 20 to 30; pinnae 8 to 16. | LEUCENA GLAUCA | 207 |
| | Leaflets more than 40 in each pinna. | **297** | |
| 297 | Pinnae 10 to 14; flowers in small spherical heads. | ALBIZZIA RICHARDIANA | 220 |
| | Pinnae 20 to 40; flowers in long cylindrical spikes. | ACACIA SUMA | 211 |
| 298 | Leaves with an even number of pinnae in opposite pairs, terminating in a pair of pinnae opposite one another. | **299** | |
| | Leaves more or less narrowed to a point, with an odd number of pinnae, or terminating in a leaflet attached to the end of the midrib. | **307** | |
| 299 | Pinnae not more than 10. | **300** | |
| | Pinnae more than 10. | **302** | |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 300 | Leaflets less than ½" long, or sometimes altogether wanting. | PARKINSONIA ACULEATA | 175 |
| | Leaflets at least ½" long. | **301** | |
| 301 | Leaflets ½" to 1" long; flowers yellow. | CAESALPINIA CACALACO | 167 |
| | Leaflets 3" to 4" long. | ACROCARPUS FRAXINIFOLIUS | 176 |
| 302 | Flowers yellow, red, or orange. | **303** | |
| | Flowers blue or purplish. | **306** | |
| 303 | Flowers yellow. | **304** | |
| | Flowers red or orange. | **305** | |
| 304 | Pinnae 16 to 20; leaves less than 2 feet long. | PELTOPHORUM INERME | 167 |
| | Pinnae up to 40 or more; leaves about 3 feet long. | SCHIZOLOBIUM EXCELSUM | 173 |
| 305 | Flowers in broad clusters, appearing from April to July. | DELONIX REGIA | 170 |
| | Flowers in compact spikes, appearing from August to October. | COLVILLEA RACEMOSA | 172 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| 306 | Leaflets about ¼″ long ; pinnae up to 60 or more. . . . . . . . . . | JACARANDA OVALIFOLIA | 341 |
| | Leaflets about ½″ long ; pinnae not more than 36. . . . . . . . . | JACARANDA FILICIFOLIA | 343 |
| 307 | Some or all the leaflets divided into narrow segments, usually silvery-grey beneath. . . . . . . . . . . . . . . . . . . . | GREVILLEA ROBUSTA | 365 |
| | Leaflets not divided into segments, not silvery-grey beneath. . . . . | **308** | |
| 308 | Leaves at least 2 feet long ; flowers at least 2″ long. . . . . . . . | **309** | |
| | Leaves less than 2 feet long ; flowers less than 1″ long. . . . . . . | **310** | |
| 309 | Flowers white, about 1″ wide ; leaflets less than 1″ wide. . . . . | MILLINGTONIA HORTENSIS | 333 |
| | Flowers purplish or yellowish, about 3″ wide ; leaflets over 1″ wide. . | OROXYLUM INDICUM | 331 |
| 310 | Leaves over 9″ long ; leaflets with toothed or notched edges ; flowers bluish or purplish. . . . . . . . . . . . . . . . . . . . | MELIA AZEDARACH | 104 |
| | Leaves less than 6″ long ; leaflets with smooth edges ; flowers yellow or whitish. . . . . . . . . . . . . . . . . . . . | **311** | |
| 311 | Pinnae 5 ; leaflets about ¼″ wide ; flowers bright yellow. . . . . . | PELTOPHORUM BRASILIENSE | 169 |
| | Pinnae about 15 ; leaflets less than ⅛″ wide ; flowers pale yellow or greenish. . . . . . . . . . . . . . . . . . . . | CAESALPINIA CORIARIA | 165 |

| Division No. | Alternatives. | Name of tree, or Division No. to be referred to. | Page No. |
|---|---|---|---|
| | **LEAVES TRIPINNATE** | | |
| 312 | Leaflets notched or toothed ; flowers bluish or purplish. . . . . . | MELIA AZEDARACH | 104 |
| | Flowers white or whitish ; leaflets with smooth edges. . . . . . . | **313** | |
| 313 | Leaflets less than 1" long ; flowers less than 2" long. . . . . . . | MORINGA OLEIFERA | 137 |
| | Leaflets 1" to 2" long : flowers over 3" long. . . . . . . . . . | MILLINGTONIA HORTENSIS | 333 |

# DILLENIACEAE

A small family containing about 12 genera and 180 species of tropical trees, shrubs, and climbers, of which 7 species are found in India. The leaves are not set in opposite pairs, and are not divided into separate leaflets. The large, white or yellow, flowers have 5 persistent sepals, and 5 petals that soon fall. The stamens are usually many, and there are generally several or many divisions of the ovary (carpels), which are more or less joined together below but have separate styles.

**DILLENIA.** (Named by Linnaeus in honour of J. J. Dillenius, a contemporary professor and botanist of Oxford). A genus of about 12 species of trees, shrubs, and climbers, all found in tropical Asia. The leaves are large, with toothed margins, and are crowded at the ends of thick branches. The flowers are solitary or in small, dense clusters. The divisions of the ovary are joined to form one fruit, which is enclosed by the fleshy sepals.

6 species are found in India, but only 1 is wild in Lower Bengal. *D. pentagyna* Roxb. is a fine tree with immense leaves up to 3 feet long, producing masses of bright yellow flowers along the leafless branches in March and April; it is a native of deciduous forests all over India, and is said to be planted in Barrackpore Park.

**Dillenia indica** Linn. *Syn.* D. speciosa *Thunb.*

(Indica means "of India". Speciosa is Latin meaning "beautiful").

| | |
|---|---|
| Bengali, | *chalta, chalita, hargesa.* |
| Hindi, | *chalta, girnar.* |
| English, | *elephant apple.* (This name is also given to *Feronia Elephantum*). |

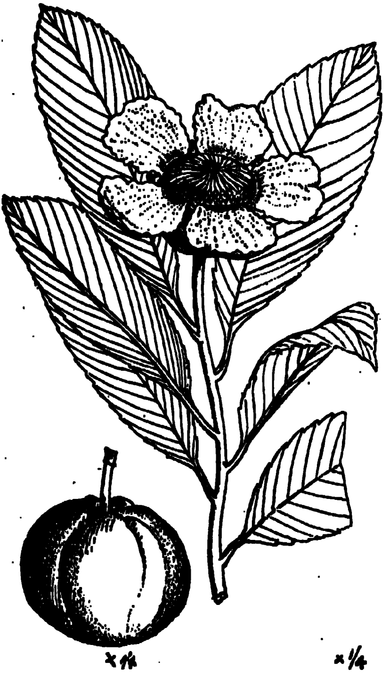
(F.I. p. 451. F.B.I. Vol. I. p. 36. B.P. Vol. I. p. 195.)

A medium-sized evergreen tree; leaves lanceolate, coriaceous, serrate, hard when old, 8 to 14 inches long; petiole 1 to 2 inches; flowers solitary, 6 inches diam.; sepals green, orbicular, thick and fleshy; petals obovate, caducous, white; styles 20, linear, recurved; fruit 3 to 5 inches diam., hard outside, fleshy within; seeds reniform, numerous.

This is an evergreen tree of moderate size, with a short but straight trunk, smooth reddish bark, and spreading branches forming a dense, round, shady head. The narrow, pointed leaves are set on short stalks near the ends of the branches; they have conspicuous veins and sharply toothed edges. The large, scented flowers grow singly among the leaves; their sepals are pale green, thick, and fleshy; they have five pure white petals, which surround numerous yellow stamens and a yellow style with twenty narrow divisions radiating outwards. The thick, rounded sepals form an outer covering for the large, spherical fruit, which contains many seeds set in a glutinous pulp.

This is one of the most beautiful trees to be found wild in Bengal, owing to its handsome evergreen foliage, and more particularly to its enormous flowers, which appear during the early part of the rains, in June and July. Unfortunately, however, the white petals last but a brief time and soon fall to the ground, leaving the calyx and the rest of the flower to develop into the round, green fruit.

The fleshy sepals surrounding the fruit have a pleasant acid taste, and are eaten either raw or cooked, but chiefly in curries, especially prawn curries. They also make a good jelly, or a cooling drink. There are several varieties, some of which have sweeter fruits than others, but in general their flavour is rather like that of an unripe apple, and when cooked they have a flavour like an apple similarly cooked, though they are rather spoilt by the large amount of fibre contained in the sepals. The fruits ripen in Lower Bengal about September.



*DILLENIA INDICA*

The wood is close-grained and fairly hard, weighing about 44 lb. per cubic foot when seasoned. It is used for making helves, gun-stocks and rafters, and for boat-building; and sometimes for panelling and inlay-work. It makes good firewood and charcoal, and is said when placed underwater to turn jet black and to last for a very long time.

Horn and ivory are sometimes polished with the aid of the rough leaves of this plant. The bark and leaves are astringent. The juice of the fruit has laxative qualities, and is used as a cough mixture and as a cooling drink in fevers.

The fruits of this tree are believed to be adapted to make use of "white ants", or termites, in the process of germination. The pulpy insides of the fallen fruits are eaten away by the termites, and the pulp is replaced by their earthy nests, in which the seeds germinate readily. The seedlings then burst out of the shell of the fruit.

The tree is found from Nepal and Assam to Ceylon, and in Malaya. It is indigenous near Calcutta, and is often planted in villages, and elsewhere. A specimen is to be found (in 1942) near the Ladies' Golf Club on the Maidan.

## MAGNOLIACEAE

A small family of about 9 genera with 70 species of trees, shrubs, and climbers, natives of warm countries. The leaves are not set in opposite pairs and in some genera are covered with a thimble-like hood when in bud; as each leaf expands it throws off the hood of the next older leaf. The sepals and petals are similar, and each flower has many of them arranged in circles or spirals round numerous stamens. The fruit usually consists of many divisions (carpels) borne on a more or less elongated stalk.

**MAGNOLIA.** (Named after Pierre Magnol, a professor of medicine and botany at Montpellier, 1638-1715). A genus of about 15 species of trees and shrubs, natives of North America and East Asia. The flowers are adapted to trap insects in order to assist cross-fertilisation of one flower by another. The petals at first stand vertically, leaving only a small opening by which insects enter in search of honey. At that time the stigmas are ripe, but no pollen has been shed. The insect visitors are at first unable to escape owing to the shape assumed by the petals, but later when the pollen has been shed, the petals open, and the insects are freed to carry the pollen to the stigmas of the next flower. The genus is known by its conspicuous "stipules", or hoods, that cover the leaf-buds, by its stamens and carpels together forming a compact cone that is not borne on a long stalk, and by the presence of only 2 seeds in each carpel.

A number of species are cultivated in temperate climates for their beautiful flowers, several of which are to be found in Indian gardens, especially in the hills.

**Magnolia grandiflora** Linn.

(Grandiflora is Latin meaning "with large flowers".)

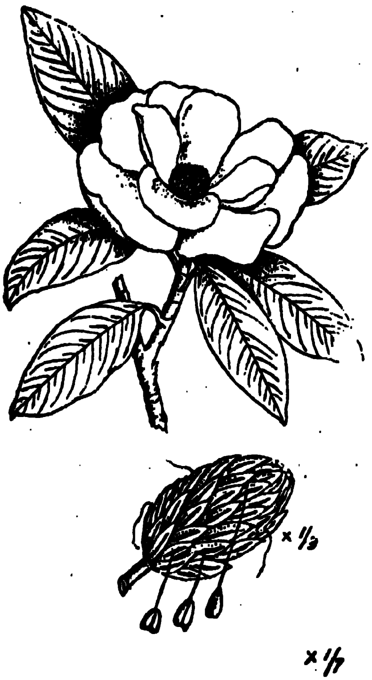
| | |
|---|---|
| Hindi, | *anda champa, him champa.* |
| English, | *lily tree, laurel magnolia, bull bay.* |

(Not in F.I., F.B.I., and B.P.)

An evergreen tree up to 80 feet high; branchlets, buds, fruit, and leaves beneath, rusty-pubescent; leaves thick and firm, oblong to obovate, glossy above, 5 to 8 inches long; flowers up to 8 inches diam.; sepals large, petaloid, white; petals 6 to 12, obovate, white; stamens purple; fruit ovoid, 3 to 4 inches long; seeds red, ultimately suspended by capillary funicles.

This is a very handsome evergreen tree with smooth grey bark and an erect pyramidal habit. It reaches a fair height in suitable climates but in Bengal only attains a moderate size. The large, thick, pointed leaves are of a dark, glossy green above, but below are covered with fine rust-coloured down. The leaf-buds are encased in thin, buff-coloured sheaths, which fall to the ground as the leaves open. The egg-shaped flower-buds are borne singly at the ends of the twigs and are coated with silky white hairs. The huge flowers have many pure white sepals and petals, which surround a tight cluster of purple stamens forming a compact mass with the many divisions of the ovary. The fruit consists of an egg-shaped cone from which a number of red seeds ultimately hang at the ends of fine threads.

This tree is occasionally planted in Calcutta, but although it grows fairly well in the climate of Bengal, it does not produce many flowers there. The few flowers that appear open in the hot weather. North America is its native country, but it is widely cultivated, and does well in many parts of India up to a height of nearly 7000 feet in the Himalayas. A number of distinct varieties are known in the U.S.A.



*MAGNOLIA GRANDIFLORA*

**Magnolia pterocarpa** *Roxb. Syn.* M. sphenocarpa *Roxb.* Liriodendron grandiflorum *Roxb.*
(Pterocarpa in Greek means "with winged fruit"; sphenocarpa in Greek means "with wedge-shaped fruit".)

Bengali, *duli champa, anda champa.*

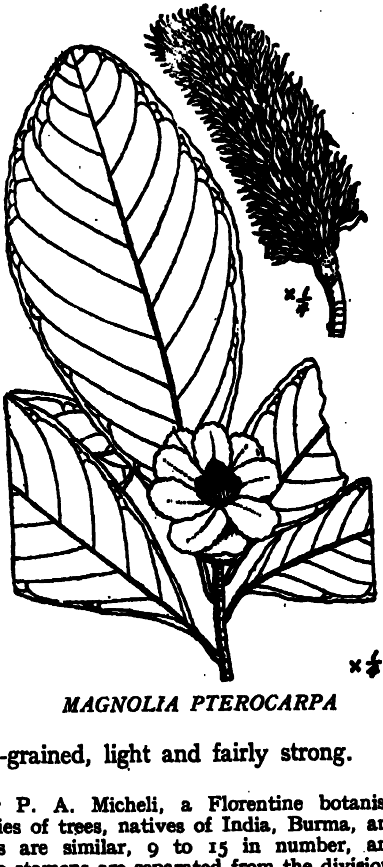
(F.I. p. 452. F.B.I. Vol. I. p. 41. B.P. Vol. I. p. 197.)

Evergreen ; young parts tawny-pilose ; leaves glabrous when mature, oblong, obtuse or acute, tapering to the base, thick, coriaceous, 8 to 16 inches long ; flowers terminal, 2 to 3½ inches across on a stout peduncle, fragrant ; petals 6, oval, fleshy, white ; fruiting spike 5 to 7 inches long by 1½ to 2½ inches wide ; carpels narrowed into long beaks ; seeds orange.

This is a big evergreen tree with a heavy rounded crown, and large, handsome, thick and leathery leaves which are broad near their tips but taper gradually towards their short stalks. The large, white, scented flowers have six fleshy petals, and grow each on a short thick stalk near the ends of the branches. The fruit consists of a dense spike formed of many long narrow divisions (carpels), which are elongated into spreading, leathery beaks.

This fine tree is a native of Assam, Burma, and the foothills of the eastern Himalayas. It is often grown in Indian gardens for its flowers, but does not succeed well in lower Bengal, where the blooms seldom come to perfection. Specimens may occasionally be seen in Calcutta gardens. The flowers open in April and May.

In Assam the sheaths of the young leaves are collected by forest people for sale to the Assamese, who chew them to blacken the teeth and gums. The timber is useful for making boxes, but does not stand exposure to damp; it is white, soft, even-grained, light and fairly strong.



*MAGNOLIA PTEROCARPA*

**MICHELIA.** (Named after P. A. Micheli, a Florentine botanist, 1679-1737). A genus of 16 species of trees, natives of India, Burma, and Malaya. The sepals and petals are similar, 9 to 15 in number, and arranged in whorls of three. The stamens are separated from the divisions of the ovary (carpels), and both the stamens and the carpels are borne on a stalk. The fruit is a long spike of separate leathery carpels, each of which usually contains more than 2 seeds.

**Michelia Champaca** Linn. M. aurantiaca *Wall.*

(Champaca is the Sanskrit name of this tree. Aurantiaca means "orange-yellow".)

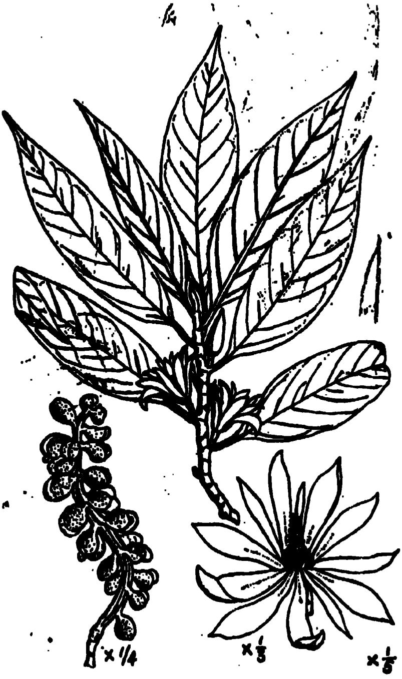
| | |
|---|---|
| Bengali, | *champa, champaka.* |
| Hindi, | *champ, champa, champaka.* |
| English, | *golden champa, yellow champa.* |

(F.I. p. 453. F.B.I. Vol. I. p. 42. B.P. Vol. I. p. 197.)

An evergreen tree; young shoots silky; leaves nearly glabrous when fully grown, 8 to 10 inches long, lanceolate, acuminate, entire; petiole ¾ to 1 inch; flowers yellow or dull orange, strongly scented, 2 inches across; petals and sepals 15, the outer oblong, the inner linear; fruiting spike 3 to 6 inches long; carpels ovoid; seeds scarlet or brown.

This is a beautiful evergreen tree with smooth grey bark, and narrow leaves somewhat resembling those of the mango. In Bengal the tree seldom exceeds 40 feet in height, though in more suitable climates it may attain 100 feet. The leaves are dark green and shining above, and in the bud are covered with hood-like stipules, or sheaths, which fall off as the leaves expand. The large flowers grow singly, each from the base of a leaf; their usual colour is a dull yellow, but a variety with pure white flowers (*var. alba*) is sometimes grown. The blooms are so strongly scented that even the bees are said to find their perfume too heavy, and to pass them by. The fruits consist of long clusters of capsules, from which the scarlet or brown seeds ultimately hang out on long cords. After flowering the trees sometimes become so heavily laden with fruit that from exhaustion they are unable to produce further flowers for years.

The tree is often planted in the vicinity of temples for it is held in special reverence by the Hindus, and is considered sacred to Vishnu. In Ceylon images of Buddha are made from the wood.



*MICHELIA CHAMPACA*

Various parts of the tree are used for a wide variety of medicinal purposes. The bark in particular is employed as a tonic, and to reduce fever. The flowers are used to cure coughs and rheumatism. The scented oil obtained from the flowers is believed to be useful in ophthalmia and gout, and the seeds and fruit for healing cracks in the feet.

The flowers when boiled yield a yellow dye. The fruit is said to be edible.

The heartwood is light brown and the sapwood white, the weight being 37 to 42 lb. per cubic foot. The timber is soft, but seasons and polishes well, and is extremely durable. It is used for furniture, house building, planking, boats, and drums. In some parts of the country it is said to be reserved for rajas, and in others it is seldom used because of its sacred character.

The tree is indigenous in low hills in many parts of tropical India, and in Malaya. It is much cultivated throughout the plains of India and Burma, and is not uncommon in Calcutta gardens. The white variety is also found there, and may be seen in the Royal Agri-Horticultural Gardens at Alipore ; it can only be propagated by grafting.

The flowers appear in April and thereafter at intervals throughout the hot weather and rains. In the case of the yellow-flowered variety the new leaves are produced about March, but those of the white-flowered variety mostly appear later in the hot season.

## ANONACEAE

A family of about 40 genera including about 400 species of trees, mostly natives of the tropics of the Old World. The leaves are not set in opposite pairs, and are neither toothed nor divided into separate leaflets. The flowers have 3 sepals, and either 6 or 3 petals. The numerous stamens are arranged round the divisions of the ovary (carpels), which are usually many. The fruits are of various kinds.

**POLYALTHIA.** (Greek, "healing much"). A genus of about 30 species of trees and shrubs, native of tropical Asia and Australia, distinguished principally by the flowers having 6 erect or spreading petals, and by the ripe divisions of the fruit (carpels) having only 1 seed each. The fruit consists of a cluster of berries, each on a separate stalk. About 9 species are natives of India, and 3 are found in lower Bengal.

**Polyalthia suberosa** Hk. f. & T. *Syn.* Ovaria suberosa *Roxb.*

(Suberosa in Latin means "corky".)

Bengali, *bara chali.*

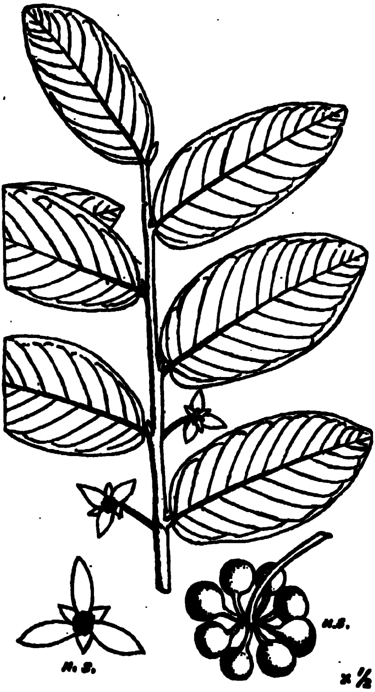
(F.B.I. Vol. I. p. 65. B.P. Vol. I. p. 204.)

Young branches rusty-pubescent ; leaves oblong, obtuse, glabrous above, puberulous beneath, 2½ to 5 inches long ; petiole 1/12 inch ; peduncles ½ to 1 inch, solitary or geminate, extra-axillary ; sepals small ; inner petals 2/5 inch long, silky outside, red-brown or yellowish ; drupels broadly ellipsoid, about ¼ inch long, reddish ; stalks of drupels about ¼ inch long.

This is a small tree or shrub, with thick, corky, brown bark, and rather narrow shining leaves with very short stalks, arranged in two rows on opposite sides of the stem. The small, yellowish or reddish-brown flowers are borne, usually singly, on stalks which are shorter than the leaves. The flowers have three minute sepals and six pointed petals in two whorls of three, of which those in the inner whorl are much the longer. The fruit consists of a cluster of reddish berries, each about the size of a pea, on stalks not more than twice their own length.

The wood of this plant is hard, close-grained, tough, and durable, weighing 40 to 45 lb. per cubic foot. It is used in carpentry generally, and for making the masts and spars of small boats.

The tree is a native of Bengal, the Western Peninsula, Tennaserim, and Ceylon. It is not uncommon in thickets and village shrubberies near Calcutta, and often flowers when still a small bush. The flowers appear in the hot weather or at the end of the cold season. The fruits ripen quickly.



*POLYALTHIA SUBEROSA*

**Polyalthia cerasoides** Hk. f. & T. *Syn.* Ovaria cerasoides *Roxb.*

(Cerasoides means "resembling the cherry".)

Hindi, ***kudumi.***

(F.B.I. Vol. I. p. 63. B.P. Vol. I. p. 204.)

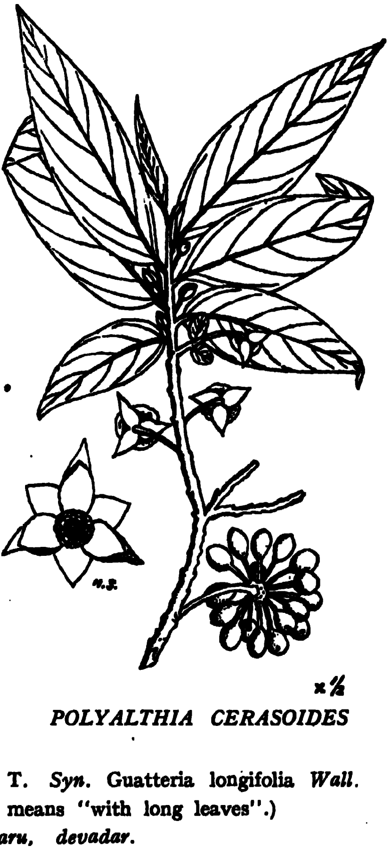
A deciduous tree up to 30 feet high; branches spreading; young branches tomentose; leaves distichous, lanceolate or oblong-lanceolate, acuminate, glabrous above, pubescent below, 3 to 8 inches long; petiole ¼ inch; peduncles axillary, 1 to 3 flowered; petals ⅓ inch long, dirty green; drupels ½ inch across, globose-oblong, red; stalks ¾ inch long, slender; seeds brown, ovoid, ¼ inch long.

This is a middle-sized deciduous tree with rough, grey bark, and downy twigs. The leaves are narrow and pointed, dark green above, pale and more or less downy beneath, and arranged in two rows on either side of the branches. The dull green fragrant flowers grow on short stalks scattered along the branchlets among the leaves ; each flower has three downy sepals, and six broad thick petals in two whorls of three. The fruit consists of a cluster of numerous red berries, resembling small cherries, each set on a slender stalk at least twice its own length.

The wood is fairly hard and close-grained, weighing 52 lb. per cubic foot. It is used for general structural purposes and for making small masts and spars for boats.

The tree is a native of Behar, the Northern Circars and the Western Ghats. It is found occasionally near villages in the neighbourhood of Calcutta, and there are two specimens in the grounds of the Tollygunge Club.

The flowers appear in the hot weather.



× ½

*POLYALTHIA CERASOIDES*

**Polyalthia longifolia** Hk. f. & T. *Syn.* Guatteria longifolia *Wall.*

(Longifolia in Latin means "with long leaves".)

| | |
|---|---|
| Bengali, | *debdaru, devadar.* |
| Hindi, | *asok, devidari, devadaru, devadar.* |
| English, | *debdar, mast tree, Indian fir.* |

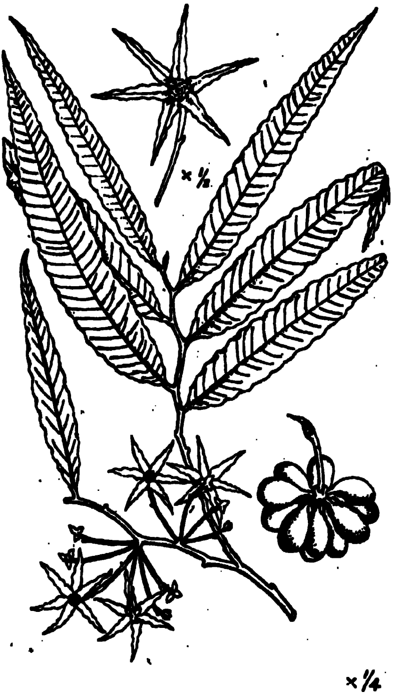
(F.B.I. Vol. I. p. 62. B.P. Vol. I. p. 204. Not in F.I.)

A tall, evergreen, glabrous tree ; leaves lanceolate, long acuminate, undulate, pellucid dotted, 5 to 8 inches long, by 1 to 2 inches broad ; petiole ¼ inch ; flowers numerous, crowded, yellow-green ; petals 6, valvate, narrow linear, ¾ to 1 inch long, spreading ; ripe drupels ovoid, ¾ inch long ; peduncle ½ inch, stout ; seeds smooth.

The debdar is a handsome evergreen tree with smooth, dark bark, a tall straight trunk, usually rather short but numerous branches, and long, tapering, narrow, drooping leaves with wavy edges. The yellowish-green flowers have six spreading, pointed petals, and are produced in dense masses along the branches, which then have the appearance of being swathed in moss. The fruit consists of a cluster of yellowish or purple berries on short thick stalks, each berry containing a single seed.

This tree is very commonly planted in all the hotter parts of India as a roadside and avenue tree, for which purpose it is very suitable owing to its graceful appearance and dense shade. The flowers, which appear in March and April, are not very conspicuous, because they are largely concealed by the foliage, and the tree is most beautiful when its fresh, translucent, green leaves appear in February and early March.

The fruits are borne in very large numbers, and in July and August when they ripen, they are much sought after by various creatures, especially by flying-foxes. The rejected stones of the berries may be seen scattered over the ground for a wide distance round the trees. The fruit is sometimes eaten by men in times of scarcity. A fibre can be prepared from the inner bark, and the bark as a whole is used as a febrifuge.



*POLYALTHIA LONGIFOLIA*

The wood is white, or whitish-yellow, light, very flexible and fairly close and even-grained. Its weight, when seasoned, is about 37 lb. per cubic foot. It is used for various purposes including making drums, pencils, small boxes, and, in China, matches.

Hindus use the leaves to adorn doorways, pillars, and pandals on festive occasions; but no special sacred significance is attached to the tree and its name *"debdaru"* or *"debdar"* is probably due not to any religious association but to a supposed resemblance to the true *Cedrus Deodara* of the Himalayas.

The tree is a native of Ceylon, and is now planted in most parts of India. It is very common on roadsides near Calcutta and on the Maidan. In Malaya it is associated with cemeteries, funerals, and other mournful ideas,—a reputation that is very far from its position in the minds of Indians.

A beautiful "weeping" variety of this tree, named *Polyalthia longifolia var. pendula,* is often grown in Calcutta gardens. It has short branches, which slope steeply downwards and are densely covered with dropping leaves. The lower branches often reach nearly to the ground, and the narrow outline of the tree is reminiscent of a cypress or a poplar.

**CANANGA.** (From a vernacular name in Macassar). A genus of 3 species of tall trees with large membranous leaves, natives of Burma and Malaya. The flowers have 3 sepals and 6 flat narrow petals, spreading from the base and not overlapping. The stamens are many and closely crowded, and have long tapering points at their tips. Each flower produces several separate divisions of the fruit (carpels), which are more or less egg-shaped and are borne on short stalks; each contains many seeds.

**Cananga odorata** Hk. f. & T. *Syn.* Canangium odoratum *Baill.* Uvaria odorata *Lam.*

(Odoratum in Latin means "sweet smelling".)

English, *ylang-ylang, alangilang, motooi.*

(F.I. p. 454, F.B.I. Vol. I. p. 56, B.P. Vol. I. p. 202.)

Evergreen; trunk straight; bark smooth, ashy; leaves alternate, ovate-oblong or elliptic, finely acuminate, puberulous beneath, 5 to 8 inches long, margins waved; petiole ½ inch; flowers usually 3-nate, drooping, yellow, scented; petals 6, narrow-linear, 3 inches long; carpels about 12, ½ inch or more long, globose or ovoid, black, 6- to 12-seeded.

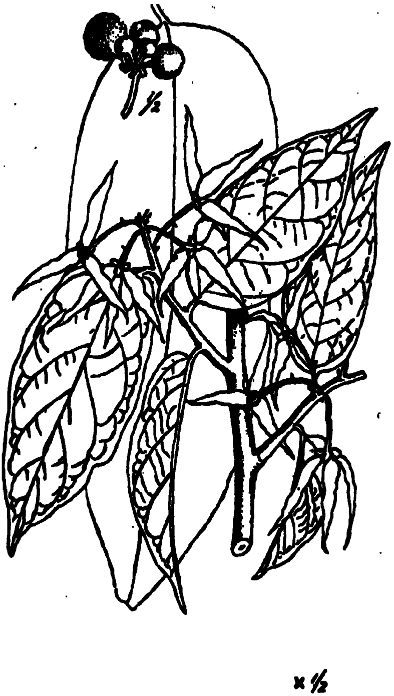
This is a tall handsome evergreen tree with smooth bark, and rather large, narrow, pointed membranous leaves with wavy edges. The fragrant, drooping, pale yellow flowers are borne on long stalks usually in small clusters among the leaves. There are six long, narrow, spreading petals, at the centre of which is a tight cluster of stamens surrounding numerous minute styles. The fruit consists of a bunch of about twelve black berries, each of which is borne on a short stalk and contains several seeds.

This tree yields a popular scent known as "ilang-ilang", or "ylang-ylang", and an oil known as "cananga oil" or "Macassar oil", which are important articles of commerce in the Philippines and Java, where they are chiefly produced. These products are obtained by steam distillation from the flowers, of which 20 lb. may be obtained from a single tree in one season, enough to produce about 1½ ounces of the "ilang-ilang" essence. The so-called "Macassar" hair-oil is said to be a solution of cananga oil in cocoanut oil.

The oil is applied externally as a cure for headache, ophthalmia and gout.

The tree is a native of Burma, Java, and the Philippines. It is cultivated throughout India and is occasionally planted in Calcutta gardens. A fine specimen grows in the compound of the Alipore Court near the boundary of Hastings House (in 1944).

The flowers appear from May to July, and again in September and October.



CANANGA ODORATA

**ANNONA.** (A Latin word meaning "year's harvest", suggested by the Haitian name of one species of this genus. Also spelt "anona"). A genus of about 60 species of trees and shrubs, natives of tropical America and Africa. The flowers have 3 small sepals, and 3 thick, rigid petals, or sometimes 6 petals of which 3 are very small. The stamens are crowded round numerous carpels, which are joined together and finally form a composite (syncarpous) fruit, consisting of a large fleshy mass containing many seeds.

There are a number of species with edible fruit, and in addition to the two plants described below *A. muricata* Linn., the sour sop, is also occasionally cultivated in India. It is distinguished from the other species by its fruit having numerous fleshy spines.

**Annona squamosa** Linn.

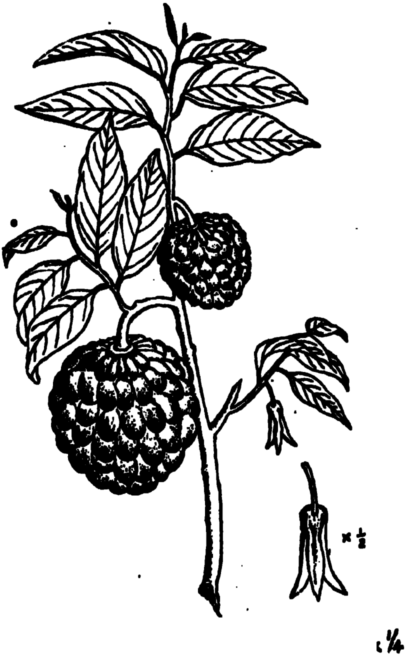
(Squamosa is Latin meaning "rough".)

| | |
|---|---|
| Bengali, | *ata, luna, meba.* |
| Hindi, | *sitaphal, sariphal.* |
| English, | *custard apple, sugar apple.* |

(F.I. p. 453. F.B.I. Vol. I. p. 78. B.P. Vol. I. p. 206.)

A straggling shrub or small tree; glabrous; leaves oblong-lanceolate. pellucid-dotted, scented, 2 to 6 inches long; petiole ¼ inch; flowers on short leaf-opposed peduncles, drooping, greenish, single or in pairs; petals 3, lanceolate, thick and fleshy, 1 inch long; stamens many, crowded; fruit 2 to 4 inches diam., irregularly globose, tuberculed, greenish.

This is a low straggling tree with thin grey bark, and rather small, narrow leaves, which when rubbed have a peculiar scent like that of ivy. The greenish flowers grow on short drooping stalks scattered along the branches, each stalk opposite a leaf. There are three thick, firm petals, within which is a compact mass of stamens surrounding the numerous stigmas. The fruit is irregularly spherical in shape, and has a very distinctive look owing to its remarkable soft, greenish rind which seems to be composed of scales, and is vaguely reminiscent of tortoiseshell. As the fruit ripens the scale-like divisions of the rind burst apart, and the fruit falls to pieces by its own weight.



ANNONA SQUAMOSA

The interior of the fruit consists of a sweet, white, custard-like pulp, in which many large, black seeds are embedded. The pulp has a delicate flavour and is much appreciated by many people, though not liked by some Europeans. It is said to make a very good cold drink.

The fruits are in season from August to November, and may sometimes be had later in the year. Owing to the great attraction that they have for birds and animals the tree has to be netted before they are ripe, or alternatively they must be picked long before they are ripe and then ripened in straw.

Several parts of the tree are employed for medicinal purposes. The root is a strong purgative, and the leaves are used for dressing wounds and ulcers. The crushed leaves are applied to the nostrils of women in hysteria and fainting fits. The seeds are a powerful irritant to the eye, and have been used to cause blindness. The seeds, leaves, and the unripe fruits contain an acrid substance which is poisonous to insects; insecticides are made from the powdered leaves and seeds, and the immature fruits are also used for this purpose after being dried, powdered, and mixed with gram-flour.

The wood is white and soft, and weighs about 46 lb. per cubic foot.

The tree is a native of tropical America, but is cultivated in most warm countries, and is commonly grown in Bengal.

The flowers appear from April to July.

**Annona reticulata** Linn.

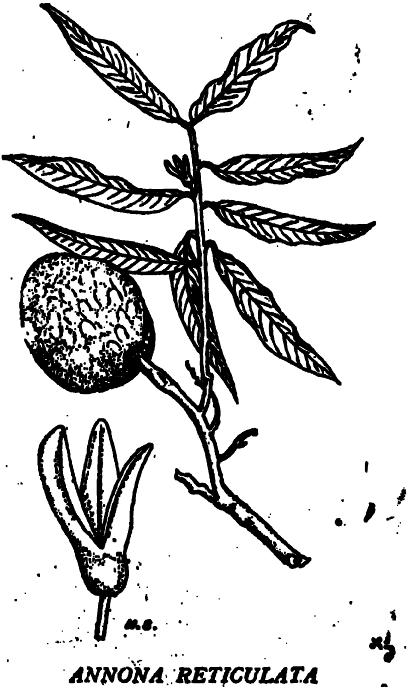
(Reticulata is Latin meaning "netted".)

| | |
|---|---|
| Bengali, | *luvuni, nona, non ata.* |
| Hindi, | *ramphal, luvuni, nona.* |
| English, | *bullock's heart, sweet sop, sugar apple.* |

(In the West Indies this tree is known as the custard apple, and *A. squamosa* as the *sugar apple* or *sweet sop*.)

(F.I. p. 453. F.B.I. Vol. I. p. 78. B.P. Vol. I. p. 206.)

A small tree; leaves oblong or oblong-lanceolate, acuminate, quite glabrous, 5 to 8 inches long by 1½ to 2 inches wide; petiole ½ inch; flowers usually 2 or 3 together on short lateral peduncles; sepals 3, 3/16 inch long; outer petals 3, 1 inch long, rigid, fleshy, greenish-white; inner petals very small; stamens many; carpels many, subconnate; fruit subglobose, roughish, up to 6 inches diam., brownish red when ripe; seeds smooth, blackish.



ANNONA RETICULATA

This small tree differs from the custard apple (see above) chiefly in having longer and narrower leaves, and fruits which, although slightly rough and marked with an indistinct network of depressed lines, do not appear to be covered with projecting scales as in the case of the custard apple. The flowers are much like those of the custard apple but are usually scattered along the branches, often in the axils of the leaves, and are not borne each opposite to a leaf. The fruits are dark brown in colour when ripe; their interior is not unlike that of the custard apple, but it has a very inferior flavour and a sandy consistency as compared with the smooth pulp of the custard apple ; they are therefore little eaten except by poor people. However, they ripen during the hot weather when custard apples are not available, and for this reason they are very welcome, and are much grown in Bengal gardens. The common English name of the fruit is due to the fact that it often has the shape of an animal's heart.

The fruit is said to be a cure for biliousness and for diseases of the blood. The bark is a powerful astringent and is used as a tonic. The seeds, leaves and young fruits have insecticidal qualities like those of *A. squamosa* (see above).

The tree is a native of tropical America. It is very common in villages near Calcutta. The flowers appear in October and continue throughout the cold weather ; they are also occasionally produced in June.

## CAPPARIDACEAE

A family of about 35 genera with over 300 species found in warm countries only. The flowers have 4 sepals, 4 petals, numerous stamens, and an ovary borne at the end of a long slender stalk (gynophore). The fruits are fleshy containing many seeds embedded in pulp.

The family is represented in Bengal by several species of *Capparis*, mostly thorny climbers, of which the best known is *C. horrida* Linn. f. (Bengali, *bagnai*). It also contains the genus *Cleome*, which includes some well-known garden annuals, and a troublesome weed with yellow flowers and sticky leaves, *C. viscosa* Linn. (Bengali, *hurhuria*).

**CRATAEVA.** (After Crataeva, an obscure writer on medicinal plants at the beginning of the first century B.C.). A genus of about 12 species of deciduous trees with leaves divided into 3 leaflets, radiating from the end of the leaf-stalk. Only the trees described below are found in India.

**Crataeva Roxburghii** *R. Br. Syn.* C. unilocularis *Ham.*

(Roxburghii is in memory of Wm. Roxburgh, the first superintendent of the Royal Botanical Garden, Calcutta. Unilocularis is Latin meaning "one-celled".)

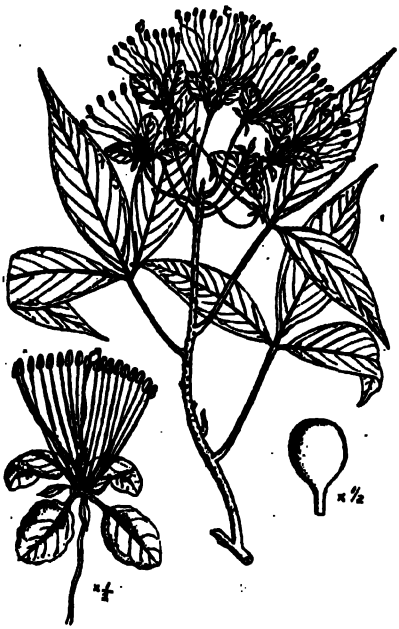
This tree has been wrongly named *Crataeva religiosa* Forst, which is the name of a Pacific island plant.

| | |
|---|---|
| Bengali, | *tikta shak, barun.* |
| Hindi, | *barna, barun, bila, bilasi, biliana, varvunna.* |
| Urdu, | *barna.* |
| English, | *Bengal quince, caper tree.* |

(F.I. p. 426. F.B.I. Vol. I. p. 172. B.P. Vol. I. p. 227.)

A deciduous, spreading tree; leaves clustered at the ends of the branches, trifoliolate, common petiole 2 to 4 inches long ; leaflets lanceolate, acuminate, the lateral oblique, 3 to 8 inches long, pale beneath ; petiolules short ; flowers in corymbs, 2 to 3 inches wide ; sepals 4, 1/8 inch long ; petals 4, about 1 inch long, clawed, white or cream-coloured ; stamens about 15, about 2 inches long, purple ; gynophore longer than stamens ; fruit a fleshy berry, globose obovoid or ovoid, 1 to 2 inches diam.

This is a spreading tree, usually of moderate size, with smooth but rather thick, grey bark, a much branched crown, and foliage thickly clustered at the ends of the twigs. The leaves are divided into three narrow pointed leaflets, glossy green above but pale beneath, each borne on a short stalk springing from the end of the main stalk of the leaf. The delicate and graceful flowers grow in broad, open clusters at the ends of the branches, on long slender stalks. The four petals are all arranged on the upper side of the flowers and are white when they first develop but soon turn a pale yellow or cream colour; each petal consists of a broad blade at the end of a narrow stalk, or claw. The many long purple stamens exceed the petals in length, but are themselves exceeded by the slender stalk of the green ovary. The fruit is spherical or egg-shaped with a rough, hard, greyish rind containing many seeds set in fleshy pulp.



CRATAEVA ROXBURGHII

The flowers are not enclosed in buds when immature, but develop gradually with all their parts exposed. When young they are green, and quite symmetrical; for the petals do not group themselves on the upper side of the flower till they are nearly mature.

When in full flower this is a very beautiful tree owing to the contrast between the purple of the stamens and the creamy yellow of the petals. Unfortunately it is rather capricious in its flowering and is seldom seen at its best. The leaves usually fall early in the year to be replaced by new foliage in March or April. The flowers generally develop soon after the new leaves, but some trees occasionally, though by no means regularly, produce a fine display of bloom in November or early December.

This species comprises a number of forms which some authorities (with good reason) have divided into three species, as follows: : —

1. *C. Roxburghii* R. Br. A fairly large tree, said to attain 100 feet in height in Assam. Leaflets not more than 3 inches long. Stamens 1½ inches long. Fruit spherical. Seeds kidney-shaped.

2. *C. Nurvala* Ham. A middle-sized tree up to 50 feet high. Leaflets 5 to 7 inches long, not bitter. Stamens over 2 inches long. Fruit egg-shaped. Seeds flat. Usually flowers in March before the preceding species.

3. *C. lophosperma* Kurz. A small or middle-sized tree, Leaflets 5 to 8 inches long, very bitter. Stamens about 2 inches long. Fruit spherical or egg-shaped. Seeds crescent-shaped with minute spinous lumps on the back. The commonest form in Assam, where it is often found on the banks of streams.

In several parts of India this tree has been much confused with the *bel* (*Aegle Marmelos*), and these two very different trees have the same vernacular names in some districts. This confusion seems to have misled some of the earlier botanists, and the uses of the two plants still tend to be confounded, though the points of resemblance are slight and quite superficial.

The leaves are used to treat rheumatism and gout. The bark is considered good for indigestion and for promoting the appetite. Both the bark and leaves after being bruised and mixed with vinegar are made into poultices, which are said to be equal to mustard plasters. The bark of the stem and roots are the principal remedy in the Hindu Pharmacopoeia for calculus affections. It is not clear whether the different forms of the plant vary in their medicinal qualities.

The fruit is said to be edible. The wood is fairly hard and even-grained and weighs about 42 lbs. per cubic foot. It is used in turnery and for making drums, models, ornaments, and combs, but it is not durable and is liable to attack by insects.

Various forms of this plant are wild in most parts of the plains of India, but not in lower Bengal though it is occasionally planted there in gardens and in villages. In some parts of India it is often grown near temples and mosques and the tombs of Moslems. It is not common in Calcutta, but there is (in 1944) a specimen on the south-west boundary of the Government House garden, and another in the south-east corner of Dalhousie Square.

THE ASIATIC SOCIETY 24 DEC 1958

# BIXACEAE

A small family of only a few genera of trees and shrubs, mostly tropical, having in the bark and elsewhere minute channels full of mucilaginous sap. The leaves have nerves which radiate outwards (digitately) from the end of the stalk and are often lobed. There are 4 or 5 sepals, 4 or 5 coloured petals, and numerous stamens. The fruit opens by from 2 to 5 valves, and contains numerous seeds which are sometimes attached to long hairs.

This family was united by earlier authorities with *Flacourtiaceae* under the name *Bixaceae*.

**BIXA.** (A South American vernacular name). A genus of one species, distinguished from other genera by its leaves without lobes, fruits opening by 2 valves, and seeds without floss.

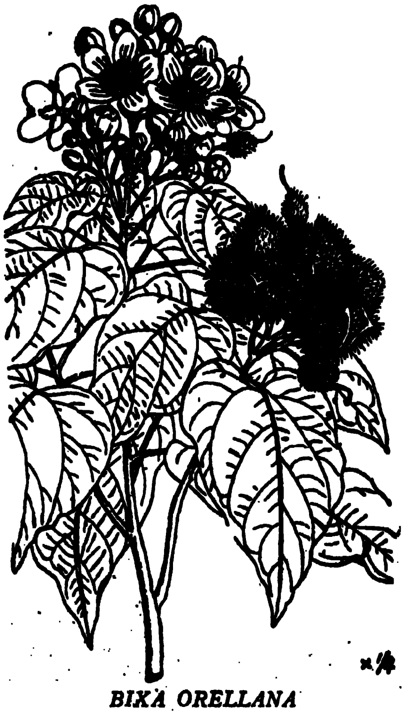
**Bixa orellana** Linn.

| | | |
|---|---|---|
| Bengali, | *latkan,* | *vatkana.* |
| Hindi, | *latkan.* | *vatkana, lathhan.* |
| English, | *annatto,* | *arnotto, roucou.* |

(F.I. p. 429. F. B. I. Vol. p. 190 B.P. Vol. I. p. 230).

A shrub or small tree; leaves alternate, cordate, acuminate, glabrous, 4 to 8 inches long by 2½ to 5 inches broad; petiole 2 to 3 inches; flowers in terminal panicles, 2-sexual, 2 inches diam.; sepals 5, imbricate, deciduous; petals 5, purple or white; capsule ovoid or subglobose, softly echinate, 1½ inches long.

The annotto is a small evergreen tree or shrub with smooth, grey bark, few branches, and dense foliage consisting of shining heart-shaped leaves set on long stalks. The large rose-coloured, purple or white flowers, which are borne in a profusion of clusters at the ends of the branches, are reminiscent of peach-blossom, though the individual flowers are considerably larger than those of the peach tree. Each flower has five distinct but overlapping sepals, five large coloured petals, and many stamens with horse-shoe-shaped anthers surrounding a single style. The fruits consist of clusters of brownish or



*BIXA ORELLANA*

greenish capsules covered with soft spines. The small seeds are surrounded by a red pulp, which yields a valuable dye.

The fruits are collected when nearly ripe, and the seeds extracted as the fruits burst. The seeds are then either boiled and pressed into cakes to make "annatto paste", or dried with their covering of pulp to make "annatto seed". Both products are employed in the colouring of cloth, cheese, butter and sweetmeats, and considerable quantities of them are exported from India to Europe.

The pulp was formerly used by the American Indians to paint their bodies for "full war paint". When applied to the skin it is said to prevent mosquito bites.

The leaves are valued as a febrifuge, as also are the seeds and the bark of the root. The whole plant is attributed with a variety of medicinal properties useful in the cure of many diseases. The dye is used to colour ointments.

The plant is a native of America, but is cultivated in many parts of India, especially in the South. It is very ornamental and is occasionally planted in Calcutta gardens. A specimen may be seen in the Zoo (in 1944) near the centre of the garden.

The flowers usually appear in October and November, but sometimes during the hot season also. The fruits mostly ripen in the hot season.

**COCHLOSPERMUM.** (From the Greek "kochlos", a spiral shell, and "sperma", a seed, in allusion to the shape of the seeds). A genus of about 13 species of trees and shrubs, of which only 1 species is a native of India. The leaves are more or less deeply divided into lobes, which radiate outwards from the centre of the leaf. The flowers have 5 sepals, 5 petals, and many stamens. The seeds are cottony.

**Cochlospermum Gossypium** *DC.* Syn. Bombax Gossypium *Willd.*

(Gossypium is the generic name of the cotton plants).

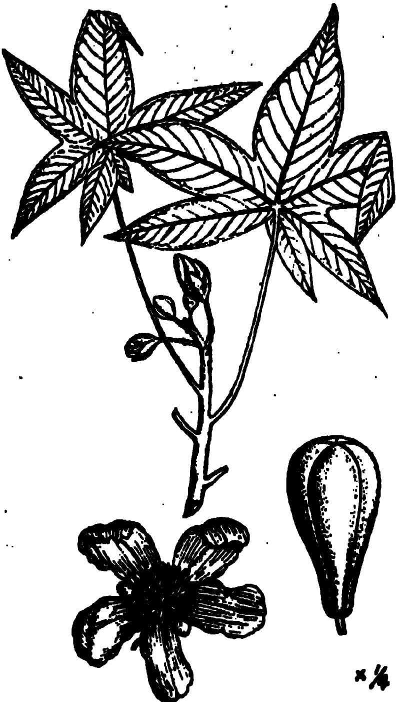
| | |
|---|---|
| Bengali, | *golgol, gabdi.* |
| Hindi, | *kumbi, gabdi, ganiar, galgal, gejra, guneri.* |
| English, | *yellow silk-cotton, torchwood tree, buttercup tree.* |

(F. I. p. 515. F.B.I. Vol. I. p. 190. B.P. Vol. I. p. 229).

A medium-sized deciduous tree; leaves near ends of branches, alternate, palmately 3-5 lobed, tomentose beneath, lobes acute, 3 to 8 inches diam.; petioles 4 to 6 inches; flowers in few-flowered terminal panicles, 4 to 5 inches diam.; sepals 5, silky; petals 5, spreading, emarginate; stamens many; capsules globose or pyriform, 3 to 4 inches long, pendulous, 5-celled at the base; seeds many, reniform, brown, rough, densely clothed with white floss.

This is a deciduous tree of moderate size, (sometimes flowering as a shrub only a few feet high), with short, stout, spreading branches, and thick, fibrous, light-coloured bark marked with deep furrows. The large leaves have several pointed lobes and are borne on rather long stalks clustered near the ends of the twigs. The foliage falls during the cold season and from the end of January till early in April the branches remain quite bare of leaves. Early in March many large flowers of a brilliant yellow colour are produced in clusters of a few flowers each, at the ends of the twigs. There are five broad yellow petals surrounding a ring of golden stamens, which encircle the single style. The fruit is a large, pendulous, pear-shaped capsule containing a number of brown, kidney-shaped seeds, to each of which is attached a quantity of pure white, silky floss.

The flowers have a startling beauty which is greatly increased by the complete absence of green leaves at the time of their appearance. There can be few things in nature to surpass them when viewed against the background of a blue sky. But when the tree is not in flower its rather ungainly growth and coarse foliage make it an unattractive plant for gardens. Several varieties are known, most of which seldom, if ever, produce fruits in the climate of Calcutta, but one variety produces many large fruits of a purplish colour.



*COCHLOSPERMUM GOSSYPIUM DC*

An orange-coloured juice exudes when the bark is cut, which forms a clear gum, known as "hog gum"; this, together with the gum of certain other trees (particularly *Bombax malabaricum*), is often sold as "*katira*" gum, though the true *katira* is the more valuable tragacanth, which is found in Persia. These gums have various uses as book-binding materials, in cosmetics, and for thickening ice-creams, as well as in medicine.

The floss from the seeds is valued for stuffing pillows, and would probably be more employed for this purpose were it not for the difficulty of collecting it. A useful cordage fibre is sometimes obtained from the bark. A red oil can be extracted from the seeds, but is little used. It is said that the leaves were formerly made into bellows for smelting iron.

The gum is considered a cure for coughs. The dried leaves and flowers are used as stimulants. The floss being soft and woolly has been recommended for padding splints and bandages.

The timber is extremely soft, and weighs only 17 lb. to the cubic foot. It is of very little use for any structural purpose but is said to be eaten in Sambalpur District after long soaking in water, and then being pounded into a paste with flour and fried.

Owing to the abundance of inflammable gum in the wood, the branches of the tree, even when green and fresh, will burn freely, and show a clear bright light; for this reason the tree is useful for making torches.

The tree is a native of dry hilly country in many parts of India and Malaya. It is common in the Chota Nagpur hills, but is not found wild in Bengal. In Ceylon it is often grown near Buddhist temples, and the flowers are used as temple offerings. In Calcutta it is not common but is occasionally planted in gardens. It is propagated from seeds, which ripen in June or July.

## FLACOURTIACEAE

A family of about 30 genera with 160 or more species, all tropical trees and shrubs. By some authorities it has been united with *Bixaceae*, from which it differs chiefly in not having mucilage or resin canals in the bark, in its leaves rarely with radiating (digitate) nerves, and in its small flowers, often without petals and often unisexual. The stamens are numerous in the male and bisexual flowers. The fruit is a capsule or berry with 1 or more seeds.

**FLACOURTIA.** (Named after E. de Flacourt, 1607-1660, General Director of the French East India Company). A genus of about 20 species of shrubs and small trees, natives of tropical Africa and Asia. The branches are usually thorny. The male and female flowers are borne on separate plants (dioecious), and grow in small clusters. There are no petals, many stamens, and several styles. The fruit is a berry containing several seeds.

In addition to the plants described below, *Flacourtia Ramontchi* L'Her. (Bengali, *benchi*), the governor plum, or batoko plum, is commonly grown in India, but only in the dryer districts. It is a small thorny-tree bearing a purplish edible fruit resembling a plum. *Flacourtia inermis* Roxb., a Malayan tree occasionally grown in South India and elsewhere, is quite thornless, and has bright red, cherry-like berries, which are ornamental but very sour.

**Flacourtia Jangomas** (*Lour.*) *Raeusch.* Syn. F. cataphracta *Roxb.*

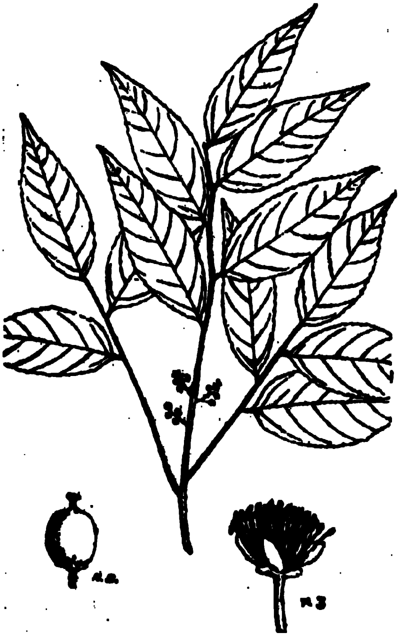
(Cataphracta is a Latin form of a Greek word meaning "armoured", or "covered with protection", in allusion to the thorns of the tree. Jangomas is a vernacular name of South India).

| | |
|---|---|
| Bengali, | *paniala.* |
| Hindi, | *talispatri, paniamalak, paniaonla.* |
| English, | *puneala plum, many-spined flacourtia.* |

(F.I. p. 739. F.B.I. Vol. I. p. 193. B.P. Vol. I. p. 231).

A small dioecious tree armed with decompound spines on the trunk; branchlets glabrous, white-dotted; leaves alternate, oblong or ovate-lanceolate, long acuminate, crenate-serrate, membranous, glabrous, up to 4 inches long; petiole about ¼ inch, tomentose; flowers dioecious, 1/10 to 1/8 inch diam., in irregular racemes; stigmas 4 to 6, capitate; fruit ellipsoid, smooth, purple when ripe, up to 1 inch long.

This is a shrub, or a small spreading tree, with smooth, pale brown bark, which flakes off in small pieces to show paler patches beneath. Its trunk is often ferociously armed with sharp compound spines, and the young branchlets are sometimes set with formidable single spikes. The long-pointed leaves have toothed or saw-like edges and are very thin, smooth, and tender in texture; they are set on short stalks in two rows on either side of the branchlets, but not in opposite pairs. The minute greenish flowers grow in small irregular clusters among the leaves, the male and female flowers being produced on separate trees (dioecious). The fruit resembles a small red or purple plum, usually slightly compressed into a five or six-sided shape.



*FLACOURTIA JANGOMAS*

This tree is well known in some parts of India as a fruit tree, and its "plums" may sometimes be seen offered for sale, threaded in a row on a straw. Firminger describes their flavour as "something better than a sloe but worse than an indifferent plum".

Before eating the fruit it is usual to roll and pinch it between the palms of the hands, when it loses much of its astringency and becomes quite palatable. It makes a good preserve when cooked with sugar. The leaves and young shoots taste like rhubarb and are used medicinally for their astringent and stomachic properties. The fruit is employed as a cure for biliousness. The powdered leaves are regarded as a remedy for coughs and bronchitis, and the bark for hoarseness.

The wood is heavy, rather hard, and brittle, but takes a good polish. It is used for agricultural implements.

This tree is a native of North Bengal, East Bengal and Chittagong. It is commonly cultivated in some parts of India, but in Calcutta is rarely seen, though a specimen may occasionally be found in orchards and shrubberies among other fruit trees. A single male tree grows on the western boundary of the Belvedere Garden (in 1943) and overhangs Alipore Road.

The flowers appear in the early part of the rains and the fruits usually ripen in September and October. The new leaves mostly appear in the early part of the hot season, and are reddish in colour.

**Flacourtia indica** (*Burm. f.*) *Merr.* Syn. F. sepiaria *Roxb.*

(Indica is Latin meaning "Indian". Sepiaria is Latin meaning "forming hedges").

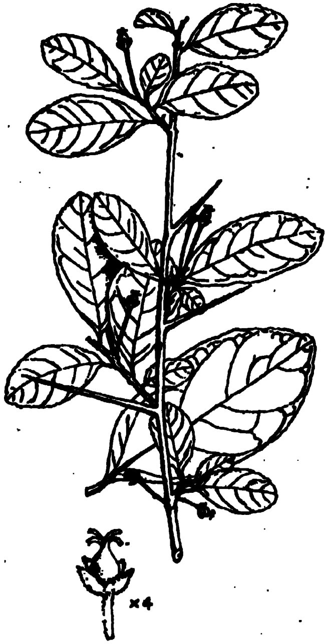
| | |
|---|---|
| Bengali, | *benchi.* |
| Hindi, | *kondai, sherawane.* |

(F.I. p. 739. F.B.I. Vol. I. p. 194. B.P. Vol. I. p. 231.)

A much-branched, spinous, deciduous shrub or small tree; spines up to 2 inches long, straight; leaves mostly in fascicles near the base of the spines, glabrous, obovate, crenate-serrate, usually cuneate at the base, up to 2 inches long; petiole very short; flowers dioecious, yellowish, about 1/5 inch diam., in small axillary or terminal cymes; stamens many, crowded; styles 6 or 7; berry with 6 or 7 pyrenes, about ½ inch diam., rugose.

This plant is usually a bushy shrub with numerous stiff, thorny branches, but it occasionally grows into a small straggling tree as much as twenty feet in height. The bark is brownish and fairly smooth, flaking off in large, thin pieces to show a darker colour beneath. The small shining leaves have blunt tips and slightly indented edges; they grow on short stalks in clusters, which are usually situated at the bases of the many sharp, straight spines that lie along the numerous twigs. The flowers are unisexual and the two sexes are found on separate plants (dioecious), the male plants apparently greatly outnumbering the female.

Both male and female flowers are very small, and yellowish in colour; they grow in clusters of a few flowers each, usually springing from the leaf-clusters, and have several greenish sepals, but no petals. The male flowers have many crowded yellow stamens, and the female, which are rather larger than the male and grow on stouter and shorter stalks, usually have six or seven styles. The fruit is a small purple berry with several angles round its circumference, and contains about six seeds.



FLACOURTIA INDICA

The leaves and roots are supposed to be an antidote to snake-bite. The bark, ground and mixed with sesamum oil, is used as a liniment in the treatment of rheumatism.

The leaves are often lopped for cattle fodder, and the fruits are occasionally eaten, though they are hard and insipid. The plant is much used for making hedges in some parts of the country, but apparently not often in Bengal. The wood is of no value except as fuel.

This plant is widely distributed throughout most parts of India, Ceylon, and Malaya. It is very common in Bengal, and is one of the most abundant constituents of scrub jungles and thickets on waste lands in the neighbourhood of Calcutta.

The flowers appear in February, March, and April, together with the new leaves, which are of a very beautiful fresh green.

# TAMARICACEAE

A family of desert, shore, and steppe plants adapted for life in sandy places. The leaves are always small, and often minute and scale-like, the long, slender, green branchlets then performing the functions of leaves. The flowers are generally minute and grouped in small spikes or clusters. The family contains 5 genera with about 90 species, natives of temperate and subtropical countries, mostly shrubs.

**TAMARIX.** (The ancient Latin name). A genus of over 60 species of shrubs and small trees, natives of Europe, Africa, and Asia. The leaves are minute and scale-like, and the small or minute flowers are grouped in spikes, usually, at the ends of the branches. The genus is distinguished by the presence of 5 or 10 stamens, which are not joined together, and 3 or 4 styles on the ovary. The fruit is a capsule with 3 valves.

In addition to the two following species of small trees, *Tamarix dioica* Roxb. is also found in sandy places in Bengal, and is occasionally planted in Calcutta gardens. This plant is a shrub with unisexual flowers, the two sexes being found on separate trees (dioecious). In this species the spikes of flowers are denser and larger than in the others, being nearly 2 inches long by 1/3 inch thick, and the tips of the branches are drooping.

**Tamarix gallica** Linn. Syn. T. indica *Rox.* T. Troupii *Hole.*
(Gallica means "of French origin," Indica means of "Indian origin".
Troupii is a commemorative name).

| | |
|---|---|
| Bengali, | *jhau, ban jhau, jaura.* |
| Hindi, | *jhau, jhaŭ.* |
| Urdu, | *jaheva.* |
| English, | *tamarisk,* |

(F.I. p. 274. F.B.I. Vol. I. p. 248. B.P. Vol. I. p. 242).

A glaucous shrub or small tree ; branches slender, articulated ; leaves minute, not sheathing, smooth, subulate or scale-like, acute ; flowers bi-sexual, 1/8 inch diam., white or pink, crowded in slender spikes collected in dense panicles at the ends of branches ; bracts shorter than flower ; stamens 5 ; styles 3 ; disk 5-lobed ; capsule 1/8 inch long.

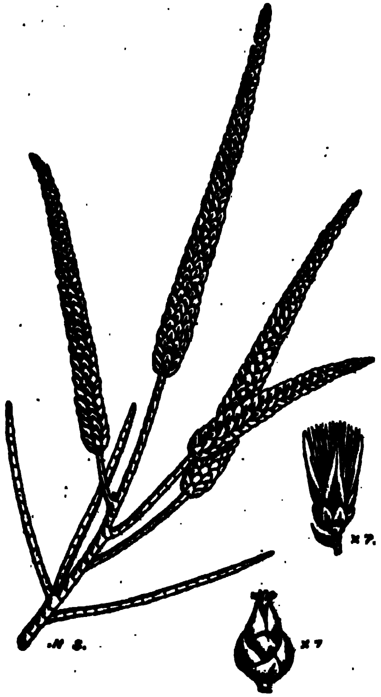
This tamarisk is a low tree or shrub with a very graceful, light and feathery look. The stems are repeatedly branched to form small green twigs, usually not more than one inch in length, on which the minute leaves appear as insignificant scales. The diminutive white or pink flowers are produced in many small spikes about one inch long, which are clustered in dense, irregularly shaped masses at the ends of the branches, making an attractive display when the tree is in full bloom. The bark of mature trees is brownish and rough, but that of young trees is smooth and reddish-brown with small pale specks.

This plant is well adapted to grow in sandy places and it even flourishes on land impregnated with salt. In some parts of northern India it covers large areas as a common jungle shrub, and (in Bengal) it is found on the banks of rivers and on the edges of marshes. It is occasionally planted in Calcutta gardens.

The galls that are commonly found in the leaves are used for dyeing and tanning, their properties being much the same as those of *T. articulata*.. The bruised twigs are also used for the same purposes in India, and the galls are sometimes exported to foreign countries.

Medicinally the galls are employed as an astringent in the cure of dysentery and similar diseases. The fruit and leaves are used for the same purpose as well as for the treatment of skin troubles, and eye diseases. The steam from the cooked twigs is said to be good for wounds and ulcers, and the galls are also used for treating them.

A variety of this plant (*var. mannifera* Ehrenb.) produces the manna that is much eaten by Bedouins and others in Arabia and Persia, and is sometimes found in Indian bazars. The manna exudes from the branches, through the minute holes made by an insect, in small honey-like drops, which solidify on exposure. It is employed medicinally in India as an aperient and expectorant, and as a cure for enlargement of the spleen. It is not known whether the varieties of this plant that are found in India are capable of producing manna.



*TAMARIX GALLICA*

The flowers appear in Bengal towards the end of the rains.

The tree is indigenous from the Mediterranean to Japan, and in most parts of India. A variety is found as if wild in England, this being perhaps the only instance of a tree being established in both England and lower Bengal. The various varieties of this plant are, however, sometimes regarded as distinct species, and the Indian form is then named *T. indica*; it is distinguished from other forms by more slender clusters (racemes) of flowers, by the deeper pink of the flowers, and by more upright branches.

**Tamarix articulata** Vahl. Syn. T. aphylla *Lanza*. T. orientalis *Forsk.*

(Articulata in Latin means "jointed". Orientalis is Latin meaning "eastern". Aphylla is from the Greek meaning "leafless").

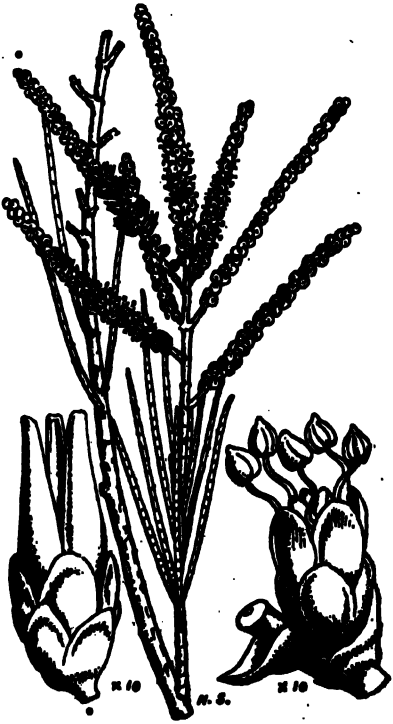
| | |
|---|---|
| Bengali, | *rakta jhau.* |
| Hindi, | *lal jhav.* |

(F.I. p. 274. F.B.I. Vol. I. p. 249. B.P. not described).

A middle-sized tree, attaining 60 feet in height; branchlets articulate at base of sheath, often greyish, fastigiate, slender, cylindric, jointed, 2 inches long or more; leaves reduced to a small sheath with a minute tooth; flowers pink, 1/8 inch diam., bi-sexual or monoecious, 5-merous, sessile, scattered on long slender spikes, which are generally in loose panicles at the ends of branches; stamens 5, inserted in alternate notches of the 10-lobed disk; capsule 1/8 inch long.

This is a low, spreading tree with rough grey bark, and an erect trunk often six feet in girth. The branches are set with clusters of slender, minutely jointed, green twigs, on which the leaves appear as insignificant membranous sheaths. The numerous, but minute, mauve or pink flowers are borne in narrow dense spikes which form loose, open clusters at the ends of the branches. When in flower during the rains, the tree is a beautiful and graceful sight with its drooping clusters of delicately-coloured blossom. At other times it might easily be mistaken for a casuarina, fir, or pine.

The bark and galls of this tree, especially the latter, are much used for tanning and dyeing, as in the case of *Tamarix gallica*. The flowers also are said to be made into a dye. The galls are often sold in bazars for medicinal and other purposes.



*TAMARIX ARTICULATA*

The bark is bitter and astringent, has tonic properties, and is also employed to cure skin diseases. The galls are very astringent and are made into a gargle. The namma that is sometimes obtained from the twigs after they have been punctured by insects is used for various medicinal purposes, and to adulterate sugar.

In some places the twigs are occasionally found to be covered with an efflorescence of salt, which is collected by poor people for flavouring food.

The timber is white and fairly hard, weighing about 61 lb. to the cubic foot. It is used for many purposes such as making ploughs, beds, and ornaments. The rapid growth of the tree makes the wood a valuable source of fuel, but it gives an offensive smell if burnt when green.

The tree is a native of Sindh, the Punjab, Baluchistan, and countries westward to Egypt and South Africa. It is well adapted to life in sandy and salt places. It is occasionally planted in Calcutta gardens, but is short-lived in lower Bengal.

## HYPERICACEAE

This is a small family of 8 genera with about 210 species, mostly herbs and shrubs but including a few trees, natives of temperate countries and of hills in the tropics. The leaves are set in opposite pairs, the sepals and petals each number 5, and the numerous stamens are arranged in 3 or 5 bundles. The family is best known by the various species of *Hypericum* (St. Johns-wort), which are common in temperate countries.

**CRATOXYLON.** (Greek "kratos", strength, and "xulon", wood). A genus of about 12 species of shrubs and trees, natives of tropical Asia. The seeds have wings and the fruit splits open down the middle of each carpel. Large yellow glands are found alternating with the bundles of stamens.

**Cratoxylon cochinchinense** (Lour.) *Bl. Syn.* C. formosum (Benth. & Hook f.)

(Cochinchinense means "from Cochin-China". Formosum in Latin means "beautiful").

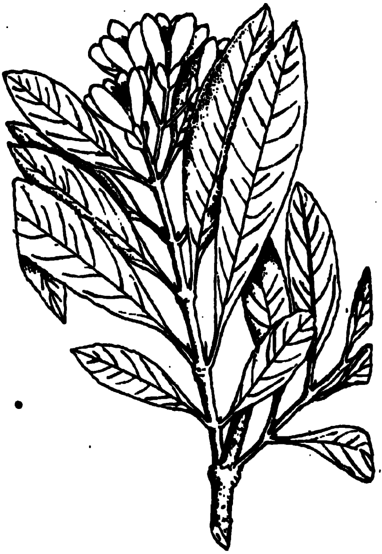
(F.B.I. Vol. I. p. 258. Not in F.I. & B.P.)

A glabrous tree, usually small; leaves opposite, decussate, broadly elliptic, membranaceous, 2 to 3½ inches long; flowers pink, ½ inch diameter, in lax, few-flowered, terminal panicles; stamens 3-adelphous; hypogynous glands triangular, attennuate; capsule ¾ inch long, 3 times the length of the calyx; seeds 1/3 inch long, with an obtuse, obovate, unilateral wing.

This low straggling tree has smooth, greyish-brown bark that flakes off in large pieces to expose a yellowish colour beneath, and thin, rather narrow, pointed leaves set in opposite pairs, those in adjoining pairs being at right angles to one another. The small pink flowers are borne in little clusters at the ends of the branches. Inside the five petals are three bundles of stamens alternating with conspicuous yellow glands. The fruit is a three-cornered capsule borne on a drooping stalk.

This tree is a native of the Andamans and Malaya. It is occasionally planted in Calcutta gardens, and a specimen may be seen (in 1944) in the south-east corner of Dalhousie Square.

The flowers appear towards the end of the hot weather and during the rains.



*CRATOXYLON FORMOSUM*

The tree is said to yield a useful timber.

# GUTTIFERAE

A family of about 24 genera with 250 species of trees and shrubs abounding in a yellow or greenish juice, natives of tropical Asia, America, and Africa. The leaves are evergreen and set in opposite pairs, and are usually smooth and shining. The flowers are sometimes unisexual and sometimes bisexual, male, female, and hermaphrodite flowers occasionally occurring on the same tree. The stamens are usually numerous and often joined in separate bundles. The sepals are usually arranged in pairs and the petals in a spiral formation. The fruit is generally in the form of a berry.

**GARCINIA.** (Named after Laurence Garcin, who lived in India and collected plants in the 18th Century). A genus of about 50 species of trees, natives of tropical Asia, Africa, and Polynesia. The male, female, and hermaphrodite flowers are often found on the same tree. The sepals and petals each number 4 or 5. The stigmas rest on the ovary, not on the end of a slender style. The fruit is a berry with a hard leathery rind containing seeds embedded in soft pulp.

This genus includes *Garcinia Mangostana* Linn., the mangosteen, which is commonly grown in Burma and elsewhere for its delicious fruit.

**Several other species may also be found occasionally in West Bengal, and over 20 species are found in India.**

**Garcinia Cowa Roxb.**

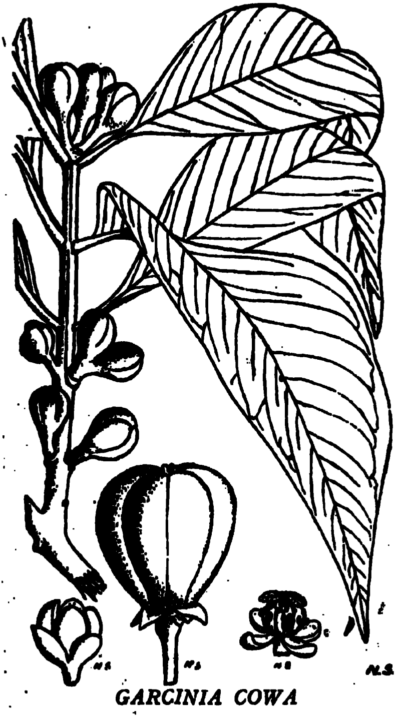
**(Cowa is an Indian vernacular name).**

| | |
|---|---|
| **Bengali,** | ***kau.*** |
| **Hindi,** | ***kowa.*** |
| **English,** | ***cowa mangosteen.*** |

**(F. I. p. 442. F.B.I. Vol. I. p. 262. B.P. Vol. I. p. 247).**

**An erect, dioecious, glabrous tree; leaves broad-lanceolate, acute at both ends, 3 to 5 inches long, membranous, secondary nerves faint in 6 to 10 pairs; flowers ½ inch diam., tetramerous, yellow; males in 3 to 8 flowered umbels, stamens numerous, densely covering a fleshy central mass; females, ovary globose, staminodes forming a ring, style grooved, stigma broad, 6 to 8-lobed, granular; fruit globose, 6 to 8-grooved, about 2 inches diam., slightly depressed at the apex and there bearing a small sessile stigma.**

This is a tall, slender tree with dark grey bark and numerous rather short, drooping branches, the lowest of which often reach the ground. The smallish, pointed, shining leaves are dark green below, and frequently have a pronounced reddish tint above. The yellow or reddish-yellow flowers are borne in small clusters mostly at the ends of the twigs. They are of two kinds, male and female, the male being smaller than female and in denser clusters. Each flower has four or five rounded sepals, and an equal number of petals of about the same size; the male flowers have numerous stamens, and the female an interrupted ring of barren stamens surrounding the ovary. The fruit is a yellow or reddish berry, sometimes as large as a small orange, slightly lobed, and with a hollow at the apex.



*GARCINIA COWA*

This tree produces a resinous gum which is used to make a yellow varnish, and in Burma is employed for medicinal purposes. The bark is also used in Burma to make a yellow dye for colouring the clothes of Buddhist monks. The fruit is said to be edible, though not very palatable. The timber is moderately hard, but is heavy, coarse-grained, and very perishable, and so is very little valued.

The tree is a native of several parts of eastern and southern India, but is rare in west Bengal. It is also found in Burma and the Andamans. A specimen (heavily burdened with an epiphytic banyan) may be seen in the Alipore Infantry Lines near the Alipore Road (1944).

The flowers appear in March and April and the fruits ripen in May and June.

**OCHROCARPUS.** (From the Greek "ochros", yellow, and "karpos", fruit). A genus of about 20 species of trees, widely spread in the tropics. The leaves are leathery and set in opposite pairs or in whorls of 3. The flowers have 2 sepals, 4 or more petals, and many stamens; unisexual and bisexual flowers occur together on the same tree (polygamous). The fruit is a berry containing a few large seeds.

**Ochrocarpus longifolius** Benth. & Hook. f. *Syn*: Calysaccion longifolium *Wight*.

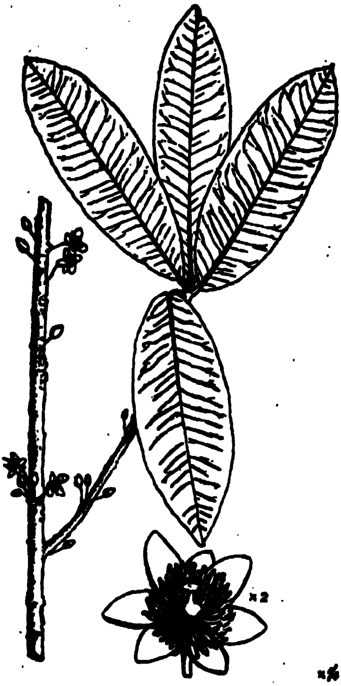
(Longifolius is Latin meaning "with long leaves").

| | |
|---|---|
| Bengali, | *nagesar.* |
| Hindi, | *nag kesar, surgi, suringi.* |

(F.B.I. Vol. I. p. 270. B. P. Vol. I. p. 245. Not in F.I.)

A large evergreen tree; leaves opposite or 3-whorled, subsessile, oblong, coriaceous, glabrous, about 8 inches long by 2½ inches wide; petiole ¼ inch; flowers polygamous or hermaphrodite, fragrant, pinkish, about 2/3 inch diam., in axillary clusters; sepals connate in a closed calyx opening in flower into 2 valvate sepals; petals 4 to 7 or more; stamens numerous; ovary 2-celled; style short, stout; stigma 3-lobed; fruit obliquely ovoid, 1 to 4-seeded, 1 inch long.

In its native habitat this is a large tree, but in the climate of lower Bengal it only attains a small size and its trunk often branches from near the base. The bark is smooth and dark grey in colour. The handsome evergreen foliage consists of rather large, narrow, glossy leaves, which are very dark green on their upper surface but beneath are much paler in colour and beautifully marked with a very delicate network of fine veins. The leaves are arranged on very short stalks in opposite pairs, or sometimes in whorls of three. The intensely fragrant flowers grow in small clusters above the branchlets, and are rose-coloured, or white striped with red. Each flower has two sepals, four or more petals, and in the case of male or bisexual flowers numerous yellow stamens; but unisexual and bisexual flowers are found mingled on the same tree. The fruit is about the size of an acorn, which it resembles in general appearance. It encloses one or more large stones, between which and the rind is a soft pulpy juice with a flavour like rose-water. The juice is much appreciated by some people, but the tree can scarcely be considered a "fruit tree".



*OCHROCARPUS LONGIFOLIUS*

A dye extracted from the flower-buds is used for colouring silk red, and a perfume resembling violets is also said to be obtained from them. The buds are believed to have stimulant and astringent properties and are employed in the treatment of dyspepsia and hæmorrhoids.

The wood is red in colour, hard, and even-grained, weighing about 55 to 60 lb. per cubic foot. It is used in Burma for planking and for the masts and yards of boats.

The tree is a native of the Western Ghats, Orissa, Chittagong and Burma. It is commonly cultivated in some parts of India for its handsome foliage, but is uncommon in Bengal. Firminger records that in his time two or three specimens were thriving near Calcutta. In 1943 a small tree was growing in the garden of Hastings House at the side of Judge's Court Road, and a young tree was planted in the garden of the Royal Agri-Horticultural Society.

The flowers appear in the early hot weather, when the trees are infested by thousands of bees in search of honey. The fruits ripen in May. The new leaves, which are produced from time to time throughout the year, are pinkish or copper-coloured when quite young, but rapidly turn pale green and then dark green.

**CALOPHYLLUM.** (Greek, "beautiful-leaved"). A genus of about 25 species of trees, natives of tropical Asia and America of which 5 species are found in India. The shining, leathery leaves are remarkable for their innumerable slender, parallel veins set at right angles to the midrib. The flowers have numerous stamens, 4 sepals, and 4 to 8 (or sometimes no) petals; of the 4 sepals, all, or the two inner only, often resemble petals. The female and hermaphrodite flowers have a long style with a flat stigma. The fruit is a berry containing a single seed.

**Calophyllum inophyllum** Linn.

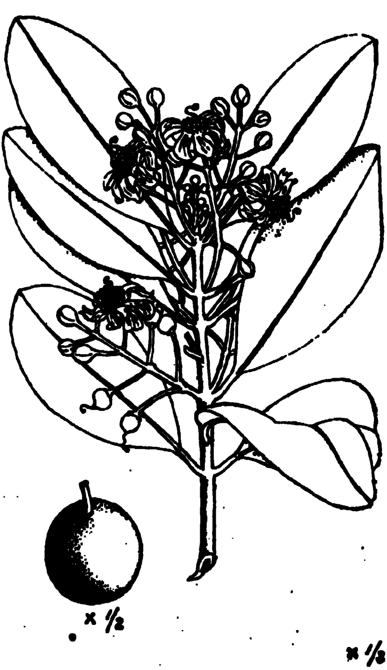
(Inophyllum is from the Greek meaning "bearing leaves with pronounced nerves or veins").

| | |
|---|---|
| Bengali, | *kath champa, sultana champa, punnag.* |
| Hindi, | *sultana champa, surpan, surpunka, undi.* |
| English, | *Alexandrian laurel, dilo oil tree.* |

(F.I. p. 437. F.B.I. Vol. I. p. 273. B.P. Vol. I. p. 246).

A middle-sized, glabrous, evergreen tree; leaves elliptic-lanceolate, obovate, 4 to 8 inches long, coriaceous, glabrous; nerves numerous, parallel, very fine, conspicuous below; petiole ½ inch to 1 inch long; flowers scented, in axillary racemes, polygamous, 1 inch diameter; petals 4, white; stamens yellow in 4 bundles; ovary usually bright pink; drupe globose, 1 inch diam., pulp scanty.

This beautiful evergreen tree is much used in India for planting on roadsides and in avenues. Its bark is smooth, and grey or blackish-brown in colour. The thick shining, dark green leaves are set in opposite pairs and are marked on the under side with innumerable fine, parallel nerves, which run at right angles to the midrib of the leaf. The fragrant, white flowers are borne in small clusters in the axils of the leaves. They are of two kinds, male and hermaphrodite. Both kinds have a cluster of yellow stamens in the centre, and the hermaphrodite flowers have a bright pink ovary within the cluster of stamens. The fruit is spherical and yellow with a smooth skin.



*CALOPHYLLUM INOPHYLLUM*

The tree yields a resinous gum, which is sometimes sold under the name of "tacamahaca gum", though the same name is applied to the gum of several other trees. From the seeds is extracted a dark green, thick, and strongly scented oil known as *pinnay, pun, domba,* or *dilo* oil which is employed in medicine, and for burning. This oil is much used as an application for the cure of rheumatism, and is also believed to be a remedy for ulcers, for hoof disease of cattle, and for skin diseases. The bark of the tree is applied to stop internal haemorrhages, while the juice is a strong purgative, and the leaves soaked in water are considered a remedy for sore eyes.

The timber is moderately hard and close-grained. It is used for masts, spars, railway sleepers, and various purposes in shipbuilding. It has also been described as a valuable wood for cabinet making, being reddish brown in colour. The weight is about 42 lb. per cubic foot.

The tree is a native of most of the southern parts of India, Ceylon, Malaya, Polynesia, and Australia, being generally found near the sea. It is much planted in tropical countries, and is not uncommon in Calcutta streets and gardens. A number of these trees are planted in Camac Street and in Diamond Harbour Road.

The flowers appear during the rains and early cold weather. The seeds are principally distributed by the agency of fruit bats.

## MALVACEAE

A family of about 60 genera with 700 species, mostly herbs, but including a few trees and shrubs. The family is spread over the whole world except the arctic regions, and is widely represented in India. The plants have leaves not set in opposite pairs, generally with nerves radiating outwards from the base (digitate), and often lobed. The sepals and petals number 5 each (the sepals being more or less joined together), and below the sepals there are usually 3 or more "bracteoles", which are often joined to form an "epicalyx", i.e., a third whorl of floral leaves below the petals and the sepals. The flowers are generally bisexual and the numerous stamens are usually joined to form a tube round the slender style. The anthers each have one pollen-cell only. The fruit consists of a number of separate divisions (carpels), or a single capsule. The genera that do not have their stamens combined to form a tube are by some authorities included in a separate family under the name *Bombacaceae*.

This family contains a number of herbs and shrubs of importance in India, including several species of *Gossypium,* which yield the cotton of commerce. Among garden plants belonging to this family are *Althaea rosea* Cav., the hollyhock, and *Malvaviscus Canzottii* Greenman, a large shrub with scarlet flowers, commonly used in Calcutta gardens to form tall hedges. *Kydia calycina* Roxb. (Hindi, *pula* or *baranga*) is a large shrub or small tree with pale bark, large, almost round, slightly lobed leaves, and big clusters of pure white flowers, which are produced from September to November; it is a native of the dryer parts of India, where it is often cultivated, and is occasionally grown in Bengal.

The family takes its name from the genus *Malva*, which includes several species of herbs common in Europe, and others found in the north of India.

**HIBISCUS.** (The classical Latin name of a mallow). A genus of about 200 species of herbs, shrubs, and small trees, chiefly indigenous in the tropics. The leaves have their principal nerves spreading outwards from the base of the leaf, and are often lobed. Beneath the calyx there is an additional whorl of floral leaves known as bracteoles. The calyx has 5 lobes or teeth, and there are 5 large, separate petals, which often take a bell-like or funnel-like shape. The numerous stamens are joined to form a narrow tube which encloses the slender style; the anthers spread outwards near the top of the tube; and 5 stigmas project from the end of the tube on 5 branches of the style. The fruit is a dry capsule which opens by 5 valves.

More than 30 species of this genus are wild or cultivated in India; several are of considerable economic importance, and some are among the most beautiful of tropical garden shrubs. *H. esculentus* Linn. (Bengali, *bhindi*) is an important annual vegetable, commonly known as ladies' fingers. *H. sabdariffa* Linn. (Bengali, *mesta*), the roselle, is another annual and is grown for its juicy calyces, which are used for making jams and jellies, and for its fibre, which resembles jute. Of the numerous shrubs and herbs grown for their flowers the best known is *H. Rosa-chinensis* Linn., (Bengali, *joba*), "The rose of China", a large shrub found in a number of beautiful varieties, and much hybridised. Other well-known species are *H. syriacus* Linn. (Bengali, *swet joba*), a shrub with white or bluish flowers, and *H. schizopetalus* Hook f., a straggling or semi-climbing shrub with pendulous scarlet flowers having deeply cut and fringed petals.

**Hibiscus tiliaceus** Linn. *Syn.* H. tortuosus *Roxb.*

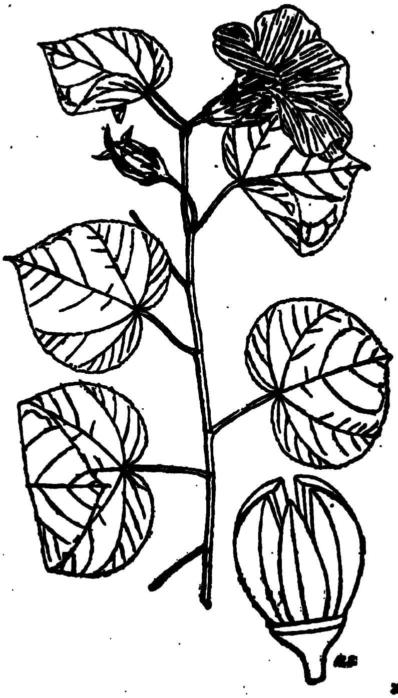
(Tiliaceus means "like a lime-tree" in reference to the shape of the leaves).

| | |
|---|---|
| Bengali, | *bola, bala, bhola.* |
| Hindi, | *bola.* |
| English, | *corkwood, lime-tree-leaved hibiscus.* |

(F.I. p. 528. F.B.I. Vol. I. p. 343. B.P. Vol. I. p. 269).

A much-branched shrub or small tree; young shoots and inflorescence pubescent; leaves alternate, crenulate, orbicular-cordate, shortly acuminate, up to 8 inches diam., grey-pubescent beneath, petiole 1 to 5 inches long; stipules falcate-oblong, ½ inch; flowers in axillary or terminal few-flowered racemes; bracteoles 10, connate, half as long as the calyx; sepals lanceolate, about as long as the capsule; corolla campanulate, 3 to 4 inches diam., yellow with crimson eye, fading to reddish: capsule ovoid, tomentose, 10-celled, 5-valved; seeds black, glabrous, with pale dots.

This is an evergreen, straggling, bushy tree with a stout, crooked trunk, smooth, pale bark, and numerous contorted branches, which spread widely close to the ground. The large leaves are almost round in outline with a shallow recess at the base where the rather long stalk is attached, and a short point at the outer end. The edges of the leaves are minutely notched; the upper surface is dull green and smooth, and the lower surface is pale grey owing to a layer of down. At the base of each young leaf-stalk is a pair of large leaf-like appendages (stipules), which are usually pinkish or reddish and contrast prettily with the green and grey of the leaves. The large drooping flowers grow at the ends of the branchlets and among the leaves, singly or in loose clusters of a few flowers. The five petals take the shape of a bell, and the inside of the bottom of the bell is dark crimson; the rest of the petals is bright yellow when the flowers open in the morning, but the yellow turns reddish in the afternoon. The calyx is cleft into five segments, and is supported beneath by from seven to ten narrow, pointed bracteoles, which are joined above their base. The stigma is divided into five branches and the style is clothed with many crimson stamens joined into a tube. The fruit is an egg-shaped capsule, the size of a nutmeg, containing a few black seeds.


*HIBISCUS TILIACEUS*

This tree is a native of the beaches and tidal forests of most tropical coasts, including Bengal, forming dense thickets near the shore and sometimes growing in places that are frequently flooded by salt water. It ascends rivers as far as the tide is felt, and is said to be found wild on the banks of the Hooghly as far north as Calcutta, though it is certainly not common there, and may have been planted in the few places where it is now found. It is sometimes grown in large gardens for its flowers, and for its handsome foliage, which gleams with silver as the light-coloured under-surface of the leaves are ruffled by the wind. Occasionally the banks of rivers and tanks are planted with this tree in order to preserve them from erosion.

The bark yields a coarse fibre of fair quality, which is used in the Sunderbans for cordage and in Ceylon for mats. It can be readily separated from the bark and does not easily rot under water. The wood is soft and almost valueless except for fuel, but it is said to be used in Tahiti for planking and for building light boats.

The root is regarded as a febrifuge, and is employed in the preparation of embrocations. In the Philippines the powdered bark is given as an emetic, an infusion of the leaves is used to wash wounds, and the flowers, boiled in milk, are applied as a cure for earaches. In Madagascar the plant is said to have emollient properties.

Sir George Watt records that the bark is said to be sucked in times of scarcity.

The flowers appear sporadically during most of the year, but particularly in the cold and hot seasons. The seeds ripen three or four months afterwards.

**Hibiscus mutabilis** Linn.

(Mutabilis is Latin meaning "changeable", in allusion to the colour of the flowers).

| | |
|---|---|
| Bengali, | *thalpadma, sphalpadma.* |
| Hindi, | *shalapara, sthalkamal.* |
| Urdu, | *guli-i-ajaib.* |
| English, | *changeable rose, confederate rose* (in America). |

(F.I. p. 525. F.B.I. Vol. I. p. 344. B.P. Vol. I. p. 268).

A large deciduous shrub or small tree, branches tomentose; leaves suborbicular, cordate, 3- to 7-lobed, irregularly crenate, more or less stellately pubescent, 4 to 9 inches long and broad; petioles usually longer than the leaves, tomentose; flowers up to 5 inches diam., axillary or terminal, pedicels up to 7 inches long; involucral bracts 7 to 10, linear-lanceolate, about ¼ inch long, shorter than the calyx; calyx-lobes 5, ovate, pubescent, green; petals twice as long as the calyx, white, pink or red; staminal tube shorter than the petals; stigmas 5, yellowish; capsule sub-globose, hirsute, endocarp lined with dense white hairs; seeds brown, densely bearded.

Almost every gardener in Bengal knows this remarkable plant, which is usually grown as a shrub, but which, if allowed to grow without pruning, soon develops into a small tree, though its straight branches, covered with smooth, greyish bark, generally spread outwards from near the ground and give it a rounded, bushy shape. The large, dull-green leaves grow on long stalks covered with fine down; their general shape is roundish, but they are recessed at the base and have about five pointed lobes or angles round the edge, from the apex of each of which a nerve leads to the point where the stalk is attached. The whole of the edge of the leaf is more or less broken by small, irregular teeth, or notches, and both surfaces are thinly covered with minute hairs. The large flowers are borne singly on rather long stalks in the axils of the leaves, or, sometimes in small clusters at the ends of the branches. Below the green, downy, five-lobed calyx is a whorl of narrow bracteoles, and from within the calyx spread several wide petals, which in the case of the normal "single" flower number five, and form a wide-mouthed bell, but in the case of the commoner "double" variety, are much more numerous and give the flower a resemblance to a double peony, or a full-blown double rose. Within the petals is a column formed by the stamens surrounding the five-lobed style. In a single flower the column is straight and covered with the pale yellow anthers which spring from it, but in a double flower the stamens are contorted and mingled with the bases of the inner petals. The fruit is a spherical, hairy capsule containing a quantity of white, cottony hairs and a number of brown, bearded seeds.

*HIBISCUS MUTABILIS*

The typical varieties of this species produce flowers the petals of which open pure white in the morning, but soon turn pink and at the end of the day a beautiful deep crimson or cerise. There are, however, other less well-known varieties differing in the colour of their flowers, their degree of "doubleness", and their tendency to change colour ; one of these has white petals which do not turn pink ; another has pink petals, which show little or no inclination to darken ; and a third has double flowers which open and change colour in stages, with the result that the flowers are mottled white and pink. The commonest and most beautiful variety has double flowers four or five inches in width, but single varieties are not rare.

This plant cannot be described as beautiful when not in bloom, but its curious and lovely flowers are very welcome when they open in large numbers and in constant succession during October and November, at which time gardens are usually lacking in colour. If heavily pruned after the main flowering, the plants will again bloom during the cold and hot seasons. The double forms are usually propagated by cuttings, but the single forms, which are more ephemeral than the double, are sometimes grown from seed. The fruits ripen soon after the flowers fall.

The change in the colour of the petals is in some way affected by sunlight, for if a freshly opened white flower is cut and taken indoors, it turns pink very slowly and only at the extremity of its petals.

The bark yields a strong fibre, but it has been found to be inferior for cordage purposes and it seems to be seldom, if ever, used. The wood is white, soft, and useless.

In Malaya and China the flowers are said to be considered an established remedy for diseases of the chest, and the leaves are applied to swellings. In Guiana the plant is used as an emollient.

China is the native habitat of this species, but it is now cultivated in most hot countries, including all parts of the plains of India. It is common in Calcutta gardens and in the neighbouring villages.

**Hibiscus populneus** Linn. *Syn*. Thespesia populnea *Cav.*
(Populneus means "poplar-like").

| | |
|---|---|
| Bengali, | *paras, paras pipal, poras, gajashundi.* |
| Hindi, | *parsipu, paras pipal, porush, bhendi, gajahanda.* |
| English, | *tulip tree, portia tree, umbrella tree.* |

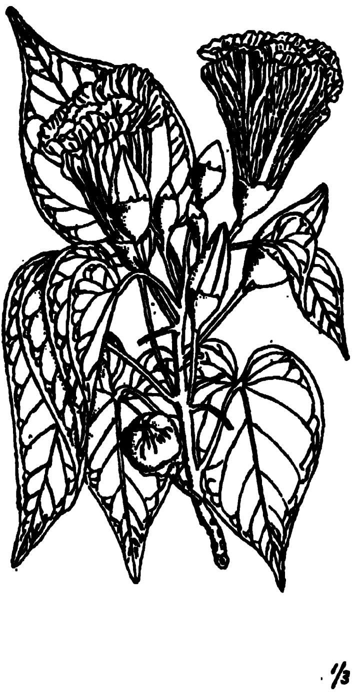
(F.I. p. 522. F.B.I. Vol. I. p. 345. B.P. Vol. I. p. 270).

An evergreen tree; leaves cordate, acuminate, entire, covered with minute scales, 3 to 5 inches long; petiole 1 to 4 inches; flowers axillary, solitary or 2 together; peduncle shorter than petiole; calyx campanulate; corolla 2 to 3 inches diameter, yellow turning mauve; staminal tube toothed at the top, filaments ascending; capsule 1½ inches long, oblong, depressed, scaly, 5-valved.

This middle-sized evergreen tree has brown, rough, and often knobbly bark, and dark-green, heart-shaped leaves ending in pronounced points, rather resembling the leaf of the peepul tree but without such a long tail at the tip. Their venation is delicate and their surface is covered with minute rusty scales, especially beneath. The rather large funnel-shaped flowers are yellow with a deep-red centre when fresh, but fade to dull purple as they wither. When young the flowers are not unlike yellow tulips, but with crinkly petals and a central column consisting of numerous stamens united into a tube. The smooth fruit is oblong with a depression in the centre above, and contains in five compartments a number of silky seeds.

This is a very quick growing tree with dense evergreen foliage and spreading branches, which make it eminently suitable as a shade tree. It is, therefore, very much planted on roadsides, and may be seen lining some of Calcutta's principal streets, as well as in parks and gardens everywhere.

A number of useful products are obtained from this tree. The flowers and fruits give a yellow-dye, though this does not seem to be widely used. From the bark a strong fibre is prepared, which is made into cordage and in Demarara into coffee-bags. An oil obtained from the seeds is burnt as an illuminant. The timber is hard and durable, and is used for gun-stocks, boats, cart-making, and wheel spokes ; its weight is about 50 lb. to the cubic foot. A red colouring matter can be obtained from the bark and wood.



*HIBISCUS POPULNEUS*

The medicinal uses of the tree are numerous. The root is taken as a tonic, while the bark is astringent and employed to cure dysentery. The heartwood is a remedy for biliousness and colic, and the fresh capsules, bruised and applied to the forehead, are considered a cure for migraine. But the tree is most used to heal skin diseases, for which purpose the flowers, fruits, leaves and bark are all employed in various ways.

The tree grows near the sea throughout the tropics, and flourishes best not far from the coast.

The flowers appear at all seasons but principally in the hot weather. As in the case of many other trees of this family, the flowers are largely pollinated by honey-seeking birds.

**CEIBA.** (An aboriginal name of Central America).

A genus of about 9 species of trees, natives of America and tropical Africa. The leaves are divided into separate leaflets, which radiate outwards from the end of the leaf-stalk. The large white or pink flowers are borne in clusters at the ends of the branches and appear before the leaves. The stamens number 5 only, and are joined at the base into a short tube; each stamen has 2 or 3 anthers. The fruit is a capsule full of white silky wool and many seeds.

**Ceiba pentandra** (L.) Gaertn. *Syn.* Eriodendron anfructuosum *DC.* E. pentandrum *Kurz.* Bombax pentandrum. *Willd.*

(Anfractuosum means "twisted". Pentandra means "with five stamens")

| | |
|---|---|
| Bengali, | *swet simal.* |
| Hindi, | *hattian, katan, safed simal, senibal.* |
| Urdu, | *sambal.* |
| English, | *white cotton tree, kapok tree.* |

(F.I. p. 513. F.B.I. Vol. I. p. 350. B.P. Vol. I. p. 271).

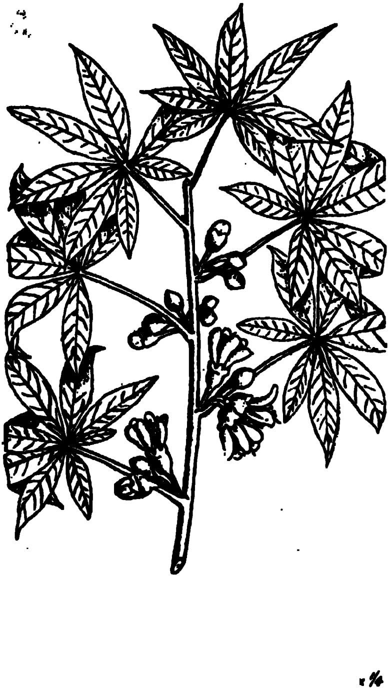
A large, deciduous, glabrous tree; branches horizontal in whorls; young trees armed with prickles; leaves digitate; leaflets 5 to 8, usually 7, elliptic, acute, 3 to 4 inches long, subsessile; petiole as long or longer than leaflets; flowers in numerous axillary fascicles near ends of branches; calyx green, campanulate, with 5 acute teeth; petals 5, oblong, connate at the base, 1 to 1½ inches long, fleshy, creamy white; stamens 5, each with 2 or 3 anthers; capsule oblong, 3 to 5 inches long, 5-valved.

This is a tall tree with a straight trunk, which is prickly when young, greyish brown bark, and numerous branches, several of which usually spring from the trunk at the same level and radiate horizontally outwards. The base of the trunk is often supported by several wide-spreading, narrow buttresses. The leaf consists of from 5 to 8 narrow, pointed leaflets, which spread outwards from the top of the rather long leaf-stalk. The foliage falls during the early part of the cold weather, and the creamy-white flowers appear in numerous small clusters near the ends of the twig, before the new leaves open, or sometimes at the same time as the leaves. The petals are shiny within but downy outside, and the five long stamens end in orange or brownish anthers. The fruit consists of a cylindrical capsule, rather like a small cucumber in shape, which is densely lined with long white silky floss. The tree closely resembles the *simal,* or red cotton tree (*Salmalia malabarica*), but may be distinguished by its small leaflets, and much smaller whitish flowers.

This tree is important owing to the excellent quality of the white floss obtained from its fruit, which is superior in quality to any other vegetable floss and is the real "kapok" of commerce. Being very elastic, it is much used for stuffing cushions and, owing to its great buoyancy and resistance to water-logging, is in demand for making lifebuoys. It is also used mixed with other fibres for textile purposes. The principal supplies of this floss come from Java, and the tree seems to be little exploited in India.

The young fruits are cooked as a vegetable and the seeds are said to be occasionally eaten ; also they have sometimes been made into cakes which are used as fodder for cattle. The wood is soft and very light, weighing only about 28 lb. to the cubic foot, and is inferior to *simal.* It is sometimes hollowed out to make dug-out canoes, and is also used to help the tanning of skins.

The juice obtained from the roots is considered a valuable cure for diabetes. A gum extracted from the trunk is given as a cure in bowel complaints. The bark is employed as a febrifuge, and the fruit to cure migraine. The very young plant is used to make a lotion, which is applied externally in cases of fever.



*CEIBA PENTANDRA*

The tree is indigenous in the Andamans, Malaya, tropical America, and possibly in Western India. It is now not uncommon in most of the hotter parts of India, and is occasionally found near Calcutta. A single tree grows (in 1942) on the Maidan on the west side of Saint George's Gate Road.

The flowers appear from January to March.

**SALMALIA.** (From the Sanskrit name of *S. malabarica*).

A genus of about 60 species of deciduous trees with digitate leaves, natives of the tropics, principally of America. The flowers are clustered near the ends of the branches, each springing singly from near the base of the leaf. The calyx is a leathery, slightly lobed tube. The stamens are numerous but are joined near the base into a short tube, each stamen having one anther only. The fruit is woolly within. Two species of this genus are found in India, but only one in west Bengal.

**Salmalia malabarica** *Schott. et Enal. Syn.* Bombax malabaricum *DC.* B. Ceiba *Linn.* B. heptaphyllum *Cav.*

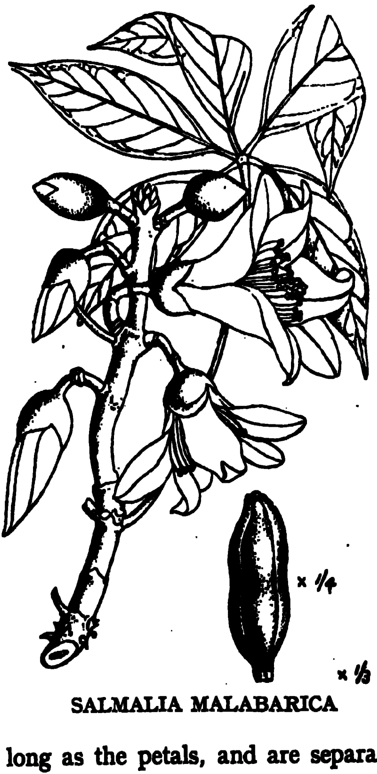
(Malabarica means "from Malabar", Ceiba is a vernacular name. Heptaphyllum is from the Greek meaning "having seven leaves", in allusion to the leaflets).

| | |
|---|---|
| Bengali, | *simal, rakta simal, tula.* |
| Hindi, | *simal, semur, shimbal, somr, kantisembal, pagun, ragatsemal.* |
| English, | *cotton tree, red silk-cotton tree.* |

(F.I. p. 514. F.B.I. Vol. I. p. 349. B.P. Vol. I. p. 271).

A large deciduous tree, prickly when young; branches in whorls of 5 or 7; leaves digitate, leaflets 5 to 7, lanceolate, 4 to 8 inches long, petiolules about 1 inch long; common petiole as long or longer than leaflets; flowers scarlet, (very rarely white or yellow); calyx silky within, glabrous without, deciduous with the corolla; petals 2 to 3 inches long; filaments about 70, much longer than tube, united into 5 clusters opposite the petals; capsule hard, woody, oblong, 4 to 5 inches long; seeds glabrous, embedded in silky white wool.

This is a tall, stately, upright tree with fairly smooth, silvery grey bark, and leaves divided into separate narrow, pointed leaflets which radiate outwards from the top of the leaf-stalk. The under-bark is deep red in colour. The trunk of the young tree is covered with stout conical prickles, while the mature tree is usually supported by several large buttresses, which reach about 5 feet up the trunk, but are only a few inches in thickness. The branches are more or less horizontal and spring from the trunk in whorls. The leaves fall at the end of the year, and in February or March, before the new leaves appear, the large crimson flowers burst out of their dark buds, and cover the ends of the branches with close-set blooms. The numerous scarlet stamens are almost as long as the petals, and are separate except at the base, each being tipped with a single purple anther.



SALMALIA MALABARICA

The woody fruits contain many smooth, egg-shaped seeds embedded in white woolly floss.

In its whorled branches and radiating leaflets this tree closely resembles *Ceiba pentandra* from which, however, it may be known by its deep red under-bark, and by the length of the stalks of the leaflets, which measure about an inch in S. *malabarica,* but are very short in *C. pentandra.* Its foliage also closely resembles that of *Sterculia foetida,* which, however, has longer leaflets, and longer main leaf-stalks, and does not have its branches arranged in definite whorls.

The cotton tree is perhaps the best known of all Indian "flowering" trees owing to the very conspicuous crimson blooms, which appear in the early spring on the bare branches before most other trees produce their flowers. The tree is made more noticeable by the great number of birds which are attracted by the honey in the huge blooms. Mynas, tailor birds, babblers, sunbirds, bulbuls, and even crows, all throng the trees, and are the principal agents in the pollination of the flowers.

The wood (known as "simul") is light and soft, and more or less white in colour. Its weight is variable but averages about 23 lb. to the cubic foot. It is not durable (except under-water, where it lasts fairly well), but is widely used for planking, packing cases, tea-boxes, floats, coffins, dug-out canoes, and the linings of wells. Recently it has also been much utilised in India for making matches, for which it is very suitable. The tree is common and quick-growing, with the result that this is probably the most important cheap timber in India. It makes good charcoal, and fairly good paper-pulp.

The flowers are edible, and the fleshy calyces are often eaten in curries. The seeds are used as a food for cattle, and the silky floss is sold as a substitute for the true kapok (the floss of *Ceiba pentandra*), under the names of "Indian kapok", and "silk cotton" or "simli cotton". It is claimed that as a material for making floats and life-jackets it is equal to the real kapok owing to its great buoyancy and resistance to water-logging ; but both this floss and the true kapok are of little use for spinning into yarns, because the fibre is too slippery to hold together. The blunt thorns from the trunk of young trees are chewed as a substitute for betel nut. The leaves and twigs are lopped for fodder.

The gum, or dried juice, yielded by the trunk, is known as "katira", and is sold as a substitute for the true "gum tragacanth", which is much used for book-binding and similar purposes. The gum under the name of "moch ras" also has a reputation as a tonic. The root has stimulant and tonic properties, and the flowers are employed to cure skin diseases.

The simul sheds its smaller branches as other trees shed their leaves, and numerous twigs up to one inch in thickness may sometimes be gathered beneath the tree. The thorns at the base of the trunk are said to prevent monkeys from eating the pulp in the young pods.

The tree is a native of Malaya and of all the hotter parts of India. It is common in the neighbourhood of Calcutta, but not plentiful. Varieties with white and yellow flowers are occasionally found and are much sought after to plant in gardens.

**ADANSONIA.** (After Adanson, a great French botanist).

A genus of 3 species of trees, natives of Africa and Australia. The leaves are divided into several leaflets that radiate outwards (digitately) from the top of the leaf-stalk. The calyx is cleft into 5 segments. The stamens are many and are joined at the base only into a short tube. The fruit is a woody capsule filled with mealy pulp.

**Adansonia digitata** Linn.

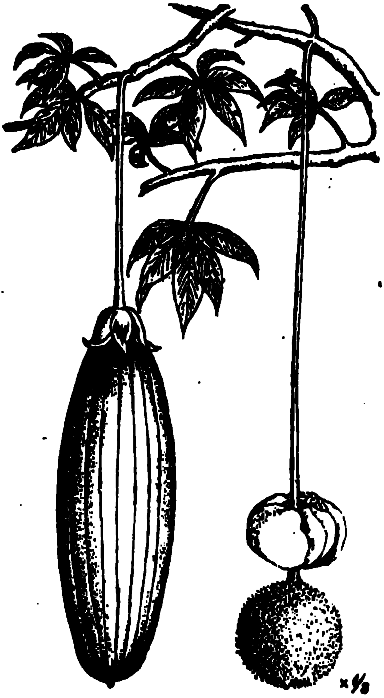
(Digitata in Latin means "fingered", in allusion to the leaves).

| | |
|---|---|
| Hindi, | *gorakamali, gorakhamli, goramlichora.* |
| English, | *baobab, monkey bread, African calabash, sour gourd.* |

(F.I. p. 513. F.B.I. Vol. I. p. 348. B.P. Vol. I. p. 270.)

A tree with a short thick trunk; leaves digitate; leaflets 5 or 7, lanceolate, downy beneath; flowers solitary, axillary, pendulous on long peduncles; calyx cup-shaped, 5-cleft; petals 5, white, adnate to the stamens below; staminal tube short, cylindrical, divided into numerous filaments above; ovary 5- to 10-celled, style slender, exerted, stigmas radiating; fruit oblong, woody, indehiscent, full of mealy pulp; seeds kidney-shaped, brown, hard, shining.

This curious tree has smooth, greyish bark and a short trunk, which is very broad at the base and tapers rapidly upwards. It is said to live to a great age, possibly as long as thousands of years, and its trunk expands steadily during the early part of its life until it reaches a thickness at the base of as much as forty feet. In its native home the tree thrives in almost desert places, and the trunk, decaying with age, becomes hollowed out in the centre and so forms a storage reservoir for water, of which as much as 250 gallons has been found in one tree; thus the old trees are helped to survive periods of drought. The branches spread widely from the tapering trunk and form a mushroom-shaped head. The leaves are divided into separate narrow, pointed leaflets, which radiate from the end of the leaf-stalk. The large white flowers hang singly on long pendulous stalks from the branches; their five petals are recurved upwards leaving a central column of stamens pointing downwards, and terminating in a dense spherical cluster of golden anthers, through the middle of which the slender style projects. The fruit is a large, green or brownish, velvety capsule almost cylindrical in shape, which is suspended at the end of the long stalk, and at a distance is reminiscent of a roosting bat. It contains a number of brown, kidney-shaped seeds embedded in soft white pulp.



*ADANSONIA DIGITATA*

The dried fruit is used as a float for fishing nets, and the pulp makes a cooling drink with a pleasant, slightly acid taste. The bark yields a strong fibre useful for cordage, which has given rise to an Indian saying "As secure as an elephant bound with a baobab rope". The wood is soft and spongy, but is suitable for making rafts. The dried and powdered leaves are sometimes mixed with food as a condiment.

The fruit is used medicinally as a cure for biliousness and dysentery, and as a febrifuge, while the leaves and bark are also employed for similar purposes. In Africa the cooked and ground seeds are given as a cure for toothache.

Certain peoples in Africa suspend dead bodies that they wish to mummify in the interior of hollow baobab trees. The explorer Livingstone records how he found some corpses being treated in this way.

The tree is a native of tropical Africa, whence it was originally brought to Ceylon and India by Arab traders. It is now widely cultivated in the tropics, especially in dry districts. A few trees have been planted in Calcutta ; two good specimens of considerable age may be seen in the Calcutta Zoo, and another near the first tee on the Barrackpore Golf Course.

The leaves fall in the cold weather leaving the tree altogether bare for several months. The new leaves appear in May and are followed by the flowers in June and July. The flowers first open at midnight, but do not close by day.

# STERCULIACEAE

A family of about 45 genera with over 700 species of trees, shrubs, and herbs, abundant in all tropical countries and in sub-tropical Africa and Australia. The plants are often covered with a down composed of minute, star-shaped hairs. The leaves are alternately arranged on the stems, and are often lobed. The calyx is more or less divided into 5 segments, and the petals are 5 in number, or sometimes wanting. The stamens are usually 5, 10 or 15 in number, and are joined together in a column. The anthers each have 2 pollen-cells. The flowers are either all bisexual, or male, female, and hermaphrodite flowers are found on the same tree, (i.e., polygamous). The fruit is often divided into a number of separate divisions (carpels) but sometimes consists of a single capsule.

The family includes *Theobroma Cacao* Linn., the cocoa tree, a native of tropical America, now cultivated in South India. It also comprises the genus *Dombeya,* of which several species and various hybrids are grown in Indian gardens; all have dense clusters of pink or white flowers which are produced during the cold weather.

**STERCULIA.** (From the Latin "stercus", muck or manure, in allusion to the evil smell of the flowers of *Sterculia foetida*). A genus of trees and shrubs, natives of the tropics and especially of tropical Asia, of which 3 species are found in India. The leaves are often lobed, and sometimes divided into separate leaflets that radiate from the end of the leaf-stalk (digitate). The flowers have no petals, and are often unisexual, the male, female, and hermaphrodite flowers being sometimes found on the same tree (polygamous). The stamens are 5 to 25 in number, and are united into a column bearing a head or ring of anthers. The fruit consists of several spreading capsules which open along the inner edge (follicles).

**Sterculia foetida** Linn.

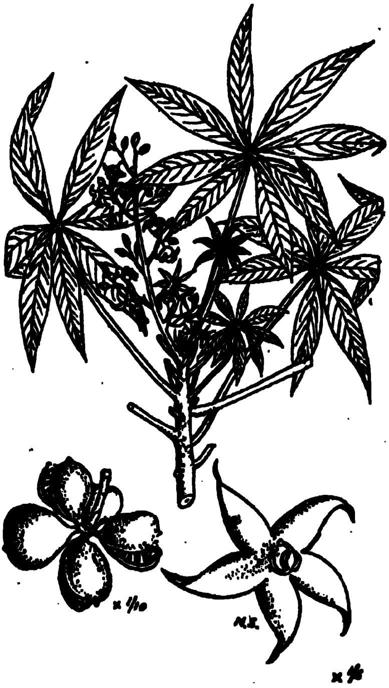
(Foetida means "evil-smelling")

| | |
|---|---|
| Bengali, | *jangli badam.* |
| Hindi, | *jangal badam, jangli badam.* |
| English, | *dung tree.* |

(F.I. p. 510. F.B.I. Vol. I. p. 354. B.P. Vol. I. p. 274.)

A tall deciduous tree; branches more or less horizontal and whorled; leaves digitate; leaflets 7 to 9, elliptical-lanceolate, about 6 inches long, sub-sessile, petiole 8 inches long; flowers polygamous, in panicles, apetalous; calyx red and yellow, or purplish, ¾ inch diam., deeply 5-partite, villous within; gynophore as long as calyx tube or longer; anthers 12 to 15; carpels 5; follicles woody, scarlet, boat-shaped, shortly beaked; seeds 10 to 15, black, 1 inch long.

This is a tall tree with branches tending to be level near the base and to spread outwards in whorls, but to rise steeply from a point not far from the trunk. The leaves are crowded at the ends of the branches, and consist of separate leaflets radiating from the end of a rather long leaf-stalk. The numerous red and yellow, or dull purple flowers are borne in clusters at the ends of the bare, or almost bare, branches, and are quickly overtopped by the bunches of new leaves. The flowers are remarkable for their exceedingly offensive smell, which is often very noticeable to passers-by, especially when the fallen flowers litter the ground beneath the branches. Male, female, and hermaphrodite flowers are found intermingled on the same tree. The fruit consists of from one to five boat-shaped pods several inches in length and red in colour, which contain large black seeds.



*STERCULIA FOETIDA*

This tree, when not in flower or fruit, resembles *Salmalia malabarica*, the *simal*, or red cotton tree, but may be distinguished by its branches not strictly arranged in whorls, its trunk devoid of prickles, and its whitish-brown bark, which flakes off in patches and is usually sprinkled with corky warts. The leaves of *S. foetida* may be distinguished from those of the *simal* by their longer leaflets and much longer leaf-stalks.

The seeds are roasted and eaten like chestnuts, but if eaten raw are said to cause nausea and vertigo. A gum is obtained from the trunk and branches, which resembles tragacanth and can be used for book-binding and similar purposes. A fibre can be got from the bark, and is made into ropes and cordage. The wood is light and of no value.

The oil from the seeds is used medicinally as a laxative and carminative. The leaves have aperient qualities, and the fruit is astringent.

This handsome tree is a native of East Tropical Africa, Western India, Burma, Ceylon, Malaya and Australia. It is occasionally planted in Calcutta and is a common roadside tree outside the city. A good specimen may be seen near Lower Circular Road, north of the Zeerut Bridge.

The foliage falls at the end of the cold season, and the flowers appear in great profusion in the latter part of February and in March, to be closely followed, or sometimes just preceded, by the new leaves. At this time the dull red of the clusters of flowers contrasts curiously with the yellowish-green of the young foliage. The flowers are pollinated by flies, which are attracted by their smell. The old pods of the previous year may sometimes be seen on the branches together with the new clusters of flowers and the young leaves.

**Sterculia villosa** Roxb.

(Villosa is Latin meaning "shaggy").

Hindi, *udal, udar.*

(F.I. p. 510. F.B.I. Vol. I. p. 355. B.P. Vol. I. p. 274.)

A moderate-sized deciduous tree; leaves oblong or ovate-oblong, deeply 5- to 7-lobed, lobes again 3-lobed, base cordate, 12 to 18 inches each way; petiole as long as the leaf; stipules large, deciduous; flowers membranous, male and bisexual mixed in long pendulous panicles; calyx campanulate, hairy outside, yellow with purple centre, ½ inch diam.; anthers 10; follicles 2 to 5, sessile, coriaceous, 1½ to 3 inches long, scarlet when ripe; seeds oblong, black, shining.

This is a middle-sized spreading tree with whitish bark, and very large deeply lobed leaves crowded at the ends of the branches. The lobes of the leaves radiate from the end of the leaf-stalk, and mostly have several subsidiary lobes on their sides. The whole leaf is densely covered with down beneath. Both male and hermaphrodite flowers are found intermingled on slender stalks in long drooping clusters before the leaves appear, so that the otherwise bare boughs are then covered with scented, yellow and crimson blooms. The fruit consists of several large hairy capsules joined at the base and spreading outwards; they turn a brilliant red when ripe and then split along their inner edge to show a number of large black seeds within. The old leaves turn yellow in October and soon fall, leaving the branches bare for a time. The flowers appear at the end of January, or early in February, to be closely followed by the new leaves, and the fruits ripen in April, when their scarlet colour gives the tree a gay look. The seeds fall in June.

The inner bark of this tree yields a coarse fibre, which is much used in many parts of India for ropes, cordage, and bag-making.

The fibre is whitish-pink in colour and strips off the tree in broad flakes which have a peculiar net-like appearance. The ropes made from it are valued for the purpose of harnessing elephants, and are often used to make halters for cattle and for tying rafts. They are said to get stronger from being wetted.

The root of the tree is occasionally eaten and the trunk yields a transparent gum. The timber is almost useless, being very light and spongy and very bad fuel.

The tree was once common in most of the hotter parts of India, but has been largely exterminated in many places owing to its useful fibre. It does not seem to be wild now near Calcutta, but is occasionally planted in gardens. Some good specimens are to be seen in the Agri-Horti. Gardens, Alipore.

*STERCULIA VILLOSA*

**PTERYGOTA.** (A Greek word meaning "wing-shaped"). A genus of 4 species of trees with simple undivided leaves, formerly united with *Sterculia*. The flowers are either unisexual or bisexual, and male, female, and hermaphrodite (polygamous) flowers are found on the same tree. The flowers are without petals. The stamens are joined (in male flowers) into a cylindrical tube. The fruits are large, roundish, hard, and woody, and open by one valve to release many broadly winged seeds.

**Pterygota alata** R.Br. *Syn*: Sterculia alata *Roxb.*

(Alata in Latin means "winged", in allusion to the seeds).

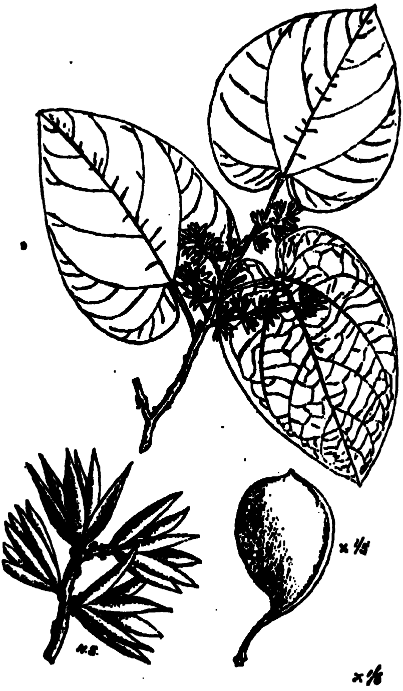
| | |
|---|---|
| Bengali, | *buddha narikella.* |
| English, | *Buddha's coconut.* |

(F.I. p. 509. F.B.I. Vol. I. p. 360. B.P. Vol. I. p. 274.)

A tall deciduous tree; leaves broadly ovate-cordate, acute, 4 to 12 inches long, clustered near ends of branches; petiole 1 to 4 inches; flowers in short racemes from the leafless axils, few flowered; racemes shorter than the leaves; calyx campanulate, densely tomentose, deeply 5-partite, segments lanceolate, red-veined within, nearly 1 inch long; anthers in male flowers about 5 in a ring at the top of column, in hermaphrodite flowers in 5 sessile groups in the sinuses formed by the carpels; follicles stalked;

woody, subglobose, about 5 inches diam.; seeds many, oblong, compressed, with a wing about 2½ inches long and 1¼ inches broad.

This is probably the tallest tree growing in the neighbourhood of Calcutta, and its short branches, which often spring from all parts of the straight trunk, give it a distinctive slender outline. The leaves are broadly heart-shaped, and are clustered near the ends of the branches on rather long stalks. The flowers, which are borne in small dense clusters along the branches, are greenish, purplish or rusty brown outside and marked with red veins within; they have an unpleasant smell. The large and almost spherical fruit is woody, covered with a fine, mealy down without, and lined with a layer of corky material within. The woody case eventually splits down one side, and gapes widely to release a number of broadly winged seeds. The bark is smooth and grey and the base of the trunk is often strengthened by several narrow, wide-spreading buttresses.



*PTERYGOTA ALATA*

In some parts of India and Burma the seeds are eaten, it is said, as a cheap substitute for opium, though the tree does not seem to be otherwise recognised as having any narcotic properties. The timber is light, coarsely fibrous and of no value.

The tree is a native of south-western India, Sikkim, Assam, Chittagong, Burma and the Andamans. It is often planted near Calcutta, where it is conspicuous owing to its great height. Its upper branches are a favourite nesting place for vultures.

The flowers appear in February and March, at which time the old leaves begin to fall. The fresh leaves open in April and May, but for a little while after the flowering period the branches are almost bare, and the new foliage is produced irregularly, the lower branches usually becoming covered before those higher up.

A curious veriety of this tree (var. *diversifolia*) has been called *"pagla gachh"*, because no two of its leaves are the same shape. Specimens of this are very occasionally found in Bengal gardens. Some good examples are to be seen in the Royal Agri-Horticultural Society's garden at Alipore, one of which has almost all its leaves of fantastic shapes, looking as if they had been bitten or gnawed by animals. Other specimens have only some of these freakish leaves, the remainder being more or less normal.

**ERYTHROPSIS.** (From the Greek "eruthros", red, and "opsis," appearance).

A genus of trees, formerly united with *Sterculia*. The leaves are divided into several lobes which spread outwards from the base of the leaf. The brightly coloured flowers are borne in open clusters (panicles) at the ends of the branches. The calyx is covered with down and is tubular in shape. There are no petals, and the stamens are joined into a tube bearing about 30 anthers. The fruit consists of 5 papery divisions (follicles), each on a short stalk ; the divisions open before they are ripe by 2 valves and disclose 2 seeds, one of which adheres to each valve.

**Erythropsis colorata** (Roxb.) Burkill. *Syn*. Sterculia colorata *Roxb*. Firmiana colorata *R. Br*.

(Colorata in Latin means "coloured").

| | |
|---|---|
| Bengali, | *mula*. |
| Hindi, | *bodula, walena, samari*. |

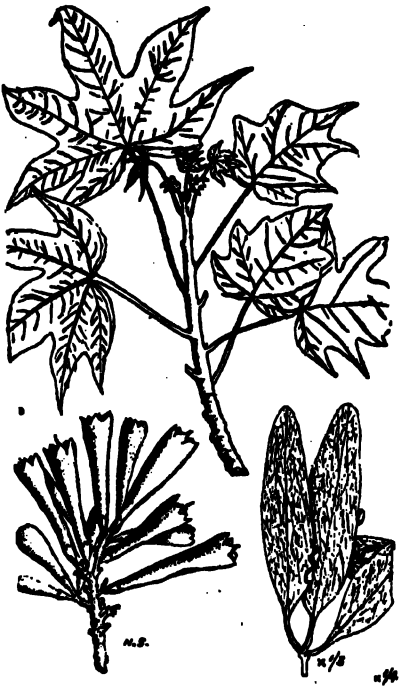
(F.I. p. 507. F.B.I. Vol. p. 359. B.P. Vol. I. p. 274.)

Leaves roundish, 6 to 12 inches wide, shallowly 3- or 5-lobed, lobes triangular, acuminate ; petiole 3 to 8 inches long ; panicles numerous, erect ; the entire inflorescence covered with orange or scarlet stellate tomentum ; calyx 2/3 to 1½ inches long, funnel-shaped, the mouth 5-toothed ; follicles 1 to 5, stalked, oblong-lanceolate, obtuse, membranous 2 to 3 inches long ; seeds ovoid, about ½ inch long, 1 on one or both of margins of the follicle.

This is a medium-sized or tall tree with grey bark, and often rather short branches that give the tree a narrow shape. The leaves are large and more or less round, with several broad lobes, each tapering to a point. The foliage is shed during the cold season, after which the tree stands bare for several months, but in March a number of stiff, erect clusters of narrow flowers appear at the ends of the twigs, and give the bare branches a strange and cheerful beauty. The stalks of the flowers, as well as the unopened buds and the flowers themselves, are densely covered with scarlet or deep orange down, giving the whole clusters the look of a mass of coral. Each fruit consists of from one to five papery sections, borne on long stalks, which open wide by two valves to reveal the seeds, usually two in number, one of which adheres to each of the gaping valves. The fruits are first green, then pink, and finally, at the end of April or in May, become pale straw-coloured. The new leaves are produced after the fruits ripen.

This tree is a native of eastern Bengal, Burma, south-western India, and Ceylon. It is occasionally planted in Indian gardens and a few trees are to be found in Calcutta. A good specimen may be seen in the Calcutta Zoo, not far from the north-east corner of the garden.

The aborigines of Ceylon regard this tree as sacred. The flowers are used in some parts of India to decorate the horns of cattle during the Holi festival.



*ERYTHROPSIS COLORATA*

**HERITIERA.** (After Charles Louis l'Heritier de Boutelle, a French botanist, 1746-1800). A genus of 6 to 7 species of evergreen trees, natives of the seashores of the tropical Old World, and of Australia. The trees are remarkable for the minute silvery scales that cover the lower sides of the leaves. The flowers are unisexual and without petals, and the male flower has 5 stamens only. The fruits consist of a number of woody capsules, which have keels or wings projecting from their surface, but do not split open.

**Heritiera littoralis** Dryander.

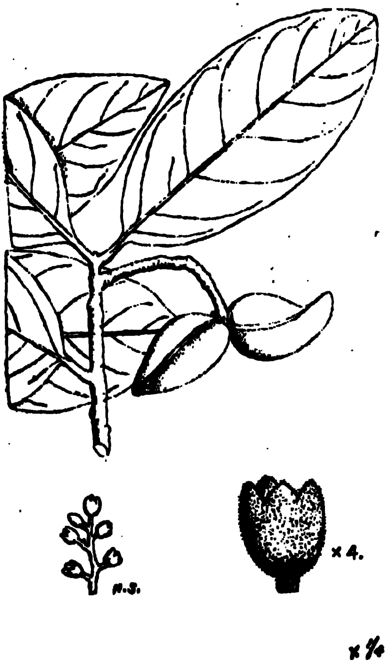
(Littoralis in Latin means "found on the seashore").

| | |
|---|---|
| Bengali, | *sundri, sunder.* |
| Hindi, | *sundri, sundari.* |
| English, | *looking-glass tree.* |

(F.I. p. 506. F.B.I. Vol. I. p. 363.)

A middle-sized gregarious or spreading tree; leaves elliptic-oblong from a rounded or slightly cordate base, silver-scaly beneath, 5 to 10 inches long; petiole ½ inch long; panicles shorter than leaves; flowers monoecious, pinkish, calyx 1/6 inch long; ripe carpels 1 to 3, glabrous, shining, with a sharp keel, 1½ to 3 inches long.

This medium-sized evergreen tree in its natural state is usually found growing in dense coppices, but when a solitary specimen is grown apart from other trees it acquires a handsome rounded outline. The large leathery leaves are dark green and glossy above but of a beautiful silvery colour beneath due to a layer of minute shining scales, which have caused the tree to be called by Europeans "the looking-glass tree". The small pinkish flowers are borne in dense clusters in the axils of the leaves. The fruit consists of a group of shining, woody, nut-like objects encircled by a hard and sharp ridge or keel.



HERITIERA LITTORALIS

This tree is adapted for life on the seashore, and often flourishes in places reached by the highest tides. The roots do not penetrate to any depth into the soil but spread about on the surface with numerous stout offshoots, which stand out from the ground, often with narrow ridges forming plank-like projections above the soil and flat, narrow buttresses to the trunk. The fruits are capable of floating for weeks in the sea, and then germinating where they are stranded at high tide.

The Sunderbans (Bengali, *sundariban,* meaning "sundari-forest") have taken their name from another closely related tree, *Heritiera Fomes* Buch., which has been much confused with *H. littoralis,* and has the same vernacular names. *H. Fomes* is very common in the Sunderbuns and is an important source of timber and firewood in Calcutta. It may be distinguished from *H. littoralis* by its smaller leaves, which are narrowed towards the base, orange coloured flowers and pods which are only slightly keeled.

The timber of both species is strong, tough, and durable, weighing about 65 lb. to the cubic foot, but that of *H. littoralis* seems to be rather the lighter and the more open in grain. Both are widely used for boat-building, piles, rafters, and similar purposes. They are also said to make excellent charcoal.

*Heritiera littoralis* is a native of many coasts of the tropics of the Old World, including South India and possibly including the Sunderbuns, where according to some authorities it is found along with *H. Fomes*, though apparently in much smaller numbers. A single fine specimen of *H. littoralis* grows in the middle of the garden of Belvedere in Alipore.

The flowers appear in February and March, and the fruits ripen during the rains.

**KLEINHOVIA.** (After Kleinhoff, a Dutch botanist, d. 1777). A genus containing a single species distinguished by hermaphrodite flowers, unequal petals, and membranous inflated fruit.

**Kleinhovia Hospita** Linn.

(Hospita in Latin means "hospitable", in allusion to the fact that the tree harbours parasites, or possibly to the well-known hospitality of Kleinhoff, in whose honour the tree was named).

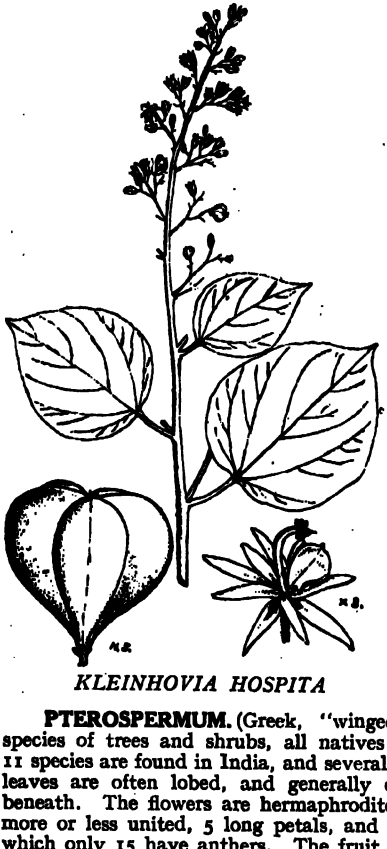
| | |
|---|---|
| Bengali, | *bola.* |
| English, | *tree antigonon.* (Owing to its supposed resemblance to the garden climber *Antigonon leptopus* Endl.) |

(F. I. p. 505. F.B.I. Vol. I. p. 364. B. P. Vol. II. p. 1272).

Leaves broadly ovate, often cordate, smooth, 3 to 12 inches long (in Calcutta seldom more than 4 inches), petiole nearly as long as the blade; flowers bisexual, in large pendulous terminal panicles, pink, ¼ inch diam.; sepals 5, equal, nearly free; petals unequal, zygomorphic; staminal tube slender, ending in a 5-fid cup, each segment bearing 3 anthers; capsule membranous, inflated, pyriform, loculicidally 5-valved; seeds 1 to 2 in each cell, black.

This is a fair-sized tree with a roundish crown and rather straggling branches. The bark is pale brown and often bears a number of knobbly excrescences. The leaves are broadly oval or heart-shaped, and are borne on rather long stalks. The small, bright pink flowers are arranged in large branched clusters which droop from the ends of the branches, and sometimes almost cover the tree with blossom. The fruit is a hollow, papery bladder, roughly pear-shaped in outline, but with 5 lobes round its circumference.

The tree retains its leaves almost throughout the year, and during the cold weather is, as a rule, partially covered with a delicate tracery of old flower stalks, to which the curious inflated pods are an added ornament. The flowers appear intermittently from May to November, but principally in August and September. The new leaves open in February or March and the branches are sometimes almost bare for a short period before their arrival.



*KLEINHOVIA HOSPITA*

The timber is white and soft, weighing only about 28 lb. to the cubic foot. When old it is said to be highly valued in Java. In the Philippines the shoots and young leaves are eaten as vegetables. A decoction of the leaves is used in Cochin-China to cure skin diseases.

The tree is a native of tropical Africa, Malaya, and Australia. It was introduced into Calcutta from the Moluccas in 1798 and is widely planted in India as an avenue tree, especially in the South, and is not uncommon in Calcutta. Several specimens may be seen on the Maidan.

**PTEROSPERMUM.** (Greek, "winged seed".) A genus of about 18 species of trees and shrubs, all natives of tropical Asia, of which about 11 species are found in India, and several are planted in lower Bengal. The leaves are often lobed, and generally covered with dense stellate down beneath. The flowers are hermaphrodite and usually large, with 5 sepals more or less united, 5 long petals, and 20 stamens joined into a tube, of which only 15 have anthers. The fruit is woody, and splits into 5 valves to release the winged seeds.

In addition to the 3 species described below *P. Heyneanum* Wall. is represented in Calcutta (in 1944) by a single specimen in the Victoria Memorial garden. This is a handsome tree not unlike *P. acerifolium* but with smaller leaves not exceeding 6½ inches in length, and smaller flowers. It flowers from October to December and ripens its fruits in the hot weather. It is a native of the western side of South India.

**Pterospermum suberifolium** Lam.

(Suberifolium in Latin means "with leaves like the cork tree").

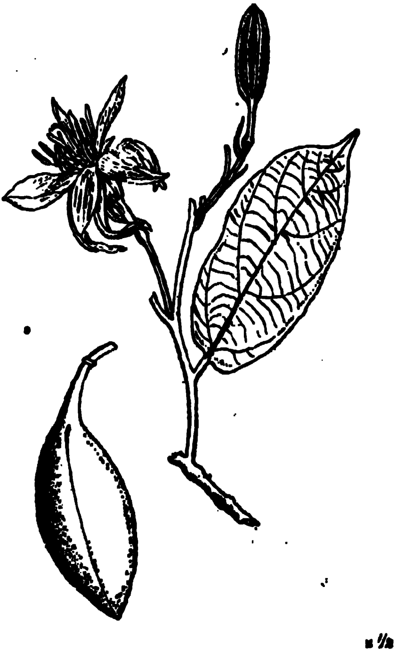
| | |
|---|---|
| Bengali, | *muchkand, muchukunda, muskunda.* |
| Hindi, | *muchkand.* |

(F.I. p. 512. F.B.I. Vol. I. p. 367. Not in B.P.)

A medium-sized tree; leaves oblong, acuminate, often coarsely and irregularly lobed in the upper part, base rounded oblique or subcordate, 3-5 nerved, very hoary beneath, 2 to 4 inches long, distichous; petiole ¼ inch long; flowers scented, yellowish-white, 1½ inches long, on short axillary 1- to 3-flowered peduncles; calyx-lobes acute, reflexed, linear; petals 5,

**deciduous with the calyx, lanceolate-oblong; capsule 2 to 3 inches long, ovoid-oblong, tapering at both ends, white-velvety; wing of seed twice as long as the seed.**

This handsome middle-sized tree has fairly smooth, greyish bark, and rather small leaves arranged all in one plane in two opposite rows on either side of the twigs. The leaves taper to a point, and are usually irregularly waved or lobed near the outer end. Their lower sides are densely covered with pale down. The scented flowers are arranged on short stalks in the axils of the leaves, each having five narrow, brownish sepals, five rather shorter but broader whitish petals, and twenty prominent stamens. The narrow, pointed, woody fruit is covered with white, velvety down and contains a number of broadly winged seeds.



*PTEROSPERMUM SUBERIFOLIUM*

The flowers, made into a paste with rice-vinegar, are a well-known cure for headache. The timber is moderately hard and very tough; it is used for building, cart-making, and other purposes.

The tree is a native of the south-west of India, and Ceylon. It is occasionally planted in Bengal. A specimen may be seen near the centre of the Calcutta Zoological Gardens.

The flowers appear in the early part of the hot season.

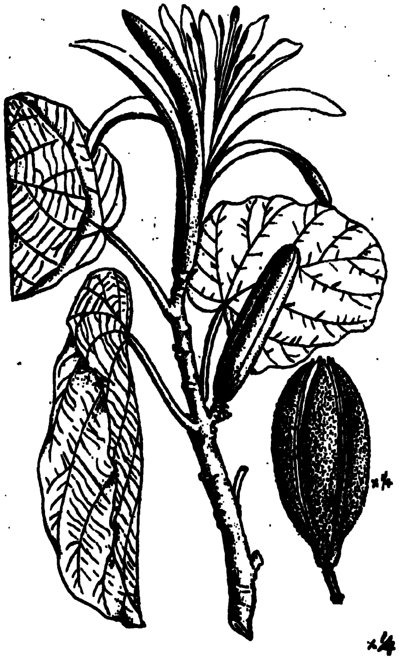
**Pterospermum acerifolium** Willd. *Syn*. P. aceroides *Wall.*

| | |
|---|---|
| Bengali, | *kanak champa.* |
| Hindi, | *kanak champa, kaniar, kathachampa.* |

(F.I. p. 511. F.B.I. Vol. I. p. 368. B.P. Vol. I. p. 276.)

**A tall evergreen tree; leaves more or less orbicular, often peltate, shallowly and irregularly lobed, glabrous above, grey-tomentose beneath, 6 to 15 inches long; petiole 4 to 12 inches; calyx segments linear, up to 5 inches long, densely tomentose outside, brownish; petals 5, linear-oblong, pure white; capsule oblong, angled, 4 to 6 inches long, 5-celled, 5-valved, clothed with brown furfuraceous deciduous tomentum.**

This is a tall and usually rather slender, evergreen tree with smooth grey bark, and twigs covered with rusty-coloured down. The leaves are usually almost round in general shape, but are more or less lobed or waved along the margins, the lobes often terminating in sharp points. The upper surface of the leaf is dark green and shining, but the lower surface is covered with grey down. This down is particularly noticeable at the end of the rains and during the cold weather, at which season the foliage, when ruffled by the breeze, appears silvery-white, and can be picked out from that of all other trees at a great distance.



*PTEROSPERMUM ACERIFOLIUM*

The very large flowers consist of narrow, pure white petals enclosed in a calyx covered with rusty down, which splits into five slender sepals, and bends backwards to release the petals. Within the petals is a tassel of white and gold stamens. The flowers are very fragrant due to small glands located on the sepals, which retain their scent long after they are dry. The fruit is a large woody capsule, with five angles, covered with brown scurfy hairs ; it takes about a year to ripen, and then splits open along its five seams, and releases numerous seeds with large, brown, membranous wings.

The leaves are used as plates, for packing tobacco, and as fodder for cattle, and are laid on roofs as an inner lining for thatch. The down from the backs of the leaves is employed to stop bleeding from wounds and as tinder. The flowers are much valued by Bengalees as a disinfectant and as a means of keeping insects away from clothes ; they are also used medicinally as a general tonic, and occasionally as a cure for inflammation, blood troubles, ulcers, leprosy, and tumours. The bark and leaves are employed in smallpox.

The sapwood is white, and the heartwood soft to fairly hard, weighing about 45 lb. to the cubic foot. It is used for planking and other purposes, and is said to take a good polish.

The tree is a native of the foot of the Himalayas, Assam, Chittagong, and Burma. It is often planted in other parts of India, and is not uncommon near Calcutta.

The flowers appear in February, March, and April. Hindus make use of them for religious purposes, but they are not offered to Vishnu.

**Pterospermum lanceaefolium** Roxb.

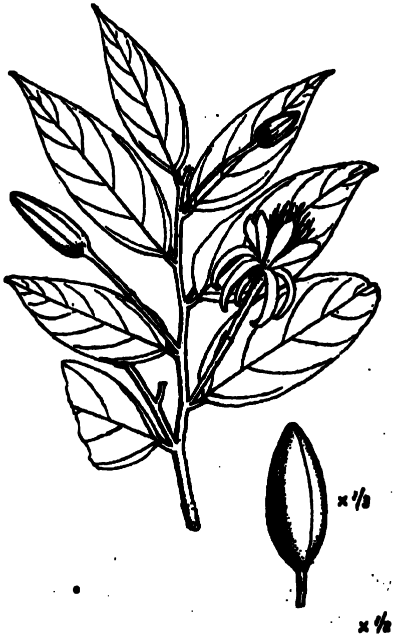
(Lanceaefolium means "with lancet-like leaves").

Bengali, *ban kalla*.

(F.I. p. 513. F.B.I. Vol. I. p. 368.)

A large tree ; young shoots and underside of leaves tomentose ; leaves lanceolate or oblong, base rounded, acuminate, entire, or shallowly lobed, 3 to 6 inches long ; petiole very short ; peduncles axillary, half the length of the leaves, stellately pubescent ; calyx 1¼ inches long ; petals 5, 1 inch long, white ; capsules lanceolate, hairy, 3 inches long ; seeds 2 to 4 in each cell.

This is a large tree with fairly smooth, light greyish bark, slender drooping branchlets, and narrow leaves, which are sometimes shallowly lobed at the end opposite the stalk, are suddenly contracted into a fine point at the apex, and are covered beneath with dense, grey or tawny down. The fragrant white flowers are borne on short stalks from near the bases of the leaves ; they are similar to those of *P. acerifolium* but very much smaller. The fruit is egg-shaped and tapers to a point ; it is not quite circular in section, has five indefinite angles, and is covered with grey down.



*PTEROSPERMUM LANCEAEFOLIUM*

The tree is a native of the north-west Himalayas, Assam, Chittagong, and Burma, and is occasionally planted in Calcutta. A specimen may be seen in the Royal Agri-Horti. gardens at Alipore.

In Assam the leaves are chewed to redden the lips. The wood is fairly hard.

The flowers appear in May and June.

**GUAZUMA.** (A South American vernacular name). A genus of 5 species of trees, natives of tropical America. The leaves are not lobed or angled, and are covered with fine down. The small bisexual flowers are borne in branched clusters, and the 5 petals have long ribbon- or claw-like appendages. There are 15 fertile stamens joined into a tube in groups of 3 alternating with 5 barren stamens (staminodes). The fruit is a woody capsule resembling a mulberry in outward appearance.

**Guazuma tomentosa** Kunth. *Syn.* Buboma tomentosa. *Spreng.*

(Tomentosa in Latin means "densely covered with short hairs").

| | |
|---|---|
| Bengali, | *nipaltunth.* |
| English, | *bastard cedar, honey-fruit tree, musket-tree.* |

(F.B.I. Vol. I. p. 375. B.P. Vol. I. p. 278)

Herbaceous portions stellate-tomentose; leaves oblong-lanceolate, obliquely cordate, acuminate, serrate, 4½ to 3 inches long; petiole short; flowers ¼ inch across, numerous, in terminal and axillary panicles; calyx campanulate, sepals ultimately reflexed; petals yellowish, clawed, hooded, terminating in 2 slender, ligulate, yellow or purple appendages; capsule ovoid or globose, woody, tubercled, black, 1 inch diam., indehiscent, many-seeded.

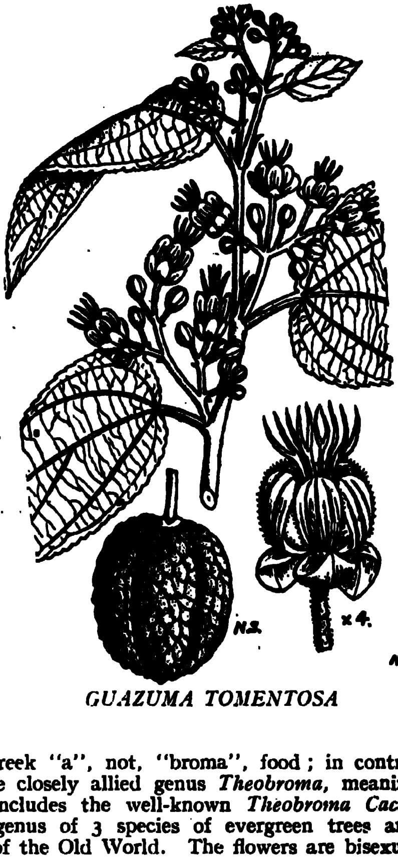
This is a small or middle-sized tree, with rough brown bark, often with gnarled branches and a straggling habit of growth. The rather narrow, pointed leaves have toothed margins, and are rough above but covered with minute down beneath, their general look being slightly reminiscent of the foliage of an English hazel bush. The small yellow, or yellow and chocolate-coloured, flowers are borne in short-branched clusters from the axils of the leaves. There are five minute hood-shaped petals, each ending in two narrow ribbons, which are usually dark in colour. The round fruit is woody, and covered with small raised lumps, the whole closely resembling a black mulberry in general appearance, though of quite a different consistency.

The fruit contains a sweet, gummy substance and is edible, while the leaves make excellent cattle fodder. A glutinous decoction of the inner bark is used in the West Indies for clarifying sugar. The young branches yield a strong fibre which is occasionally made into ropes. The timber is soft and even-grained, weighing about 38 lbs. to the cubic foot; it is made into rough furniture and packing cases.

The bark is employed as a tonic. In the West Indies the inner bark is valued as a remedy for elephantiasis, and the old bark is used to cure skin troubles and diseases of the chest.

The tree is a native of tropical America, but is now established in many hot countries. In Calcutta it is commonly planted in shrubberies and as an avenue tree, though it does not serve well for the latter purpose in Bengal owing to its rather stunted growth. It also occurs spontaneously in thickets and jungle.

The flowers appear from March to May, and again in September and October. The new leaves are produced in February and March. The fruits remain on the tree until they fall off at the next flowering period.



*GUAZUMA TOMENTOSA*

**ABROMA.** (From the Greek "a", not, "broma", food; in contradistinction to the name of the closely allied genus *Theobroma,* meaning "food of the gods", which includes the well-known *Theobroma Cacao* Linn., the cocoa plant.) A genus of 3 species of evergreen trees and shrubs, natives of the tropics of the Old World. The flowers are bisexual and have 5 petals, concave or hooded at the base, and terminating in 2 long limp appendages. 5 fertile stamens alternate with 5 barren stamens (staminodes). The fruit is a membranous capsule containing many wingless seeds.

**Abroma augusta** Linn. *Syn.* Gossipium Demonum *Rumph.*

(Augusta is Latin meaning "majestic").

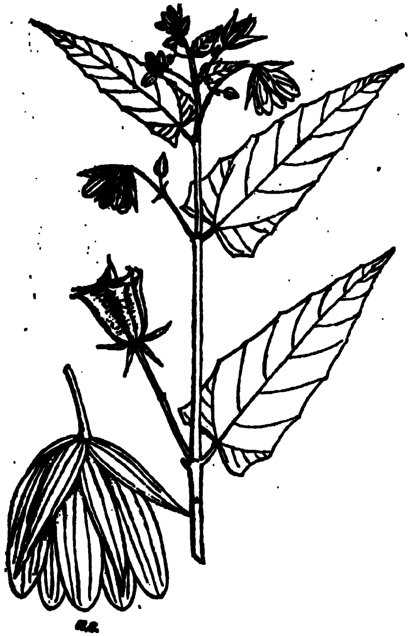
| | |
|---|---|
| Bengali, | *ulat kambal, ullat kumul.* |
| Hindi, | *kumal, ulatkambat.* |
| English, | *devil's cotton, perennial Indian hemp.* |

(F.I. p. 510. F.B.I. Vol. I. p. 375. B.P. Vol. I. p. 278.)

An evergreen shrub or small tree; branchlets pubescent; leaves membranous, finely acuminate; the upper ovate or lanceolate, cordate, sometimes entire, about 6 inches long, short-petioled; the lower orbicular-cordate, more or less lobed and serrulate, in young trees up to 18 inches diam., long-petioled; flowers in terminal or leaf-opposed, few-flowered

**cymes ; sepals pale green, lanceolate, acute, 1 inch long; petals below concave, whitish and dark purple with purple hairs, ¼ inch long, terminating above in chocolate-coloured, elliptic appendages 1 inch long ; anthers sessile, minute, alternating with larger white and purple staminodes ; styles 5 ; fruit a membranous, 5-angled, winged, septicidally 5-valved capsule with truncate apex, 2 inches long and wide ; seeds numerous, surrounded by silky hairs.**

This curious plant is a large quick growing shrub, or a small tree, with fairly smooth, greyish bark, and horizontal branches terminating in green, finely downy twigs. The evergreen foliage consists of thinly membranous, rather rough, leaves of very varied size and shape. The upper leaves are narrow and tapering with more or less smooth margins, and a recess at the base near the junction with the short stalk ; while the lower leaves are more or less round in general shape, have slightly toothed edges, and usually have about five pronounced lobes. The tips of the leaves always terminate in a fine, sharp point, and the lobes, when present, are usually pointed also. The lower leaves of young plants sometimes measure eighteen inches across, but those of old trees are usually much smaller, and the outermost leaves on the young twigs may be only two or three inches in length. The pendulous flowers hang two or three together at, or near, the ends of the twigs. The calyx consists of five pointed, pale-green sepals, joined at their base. The conspicuous part of each of the five petals is a pale chocolate-coloured flap or appendage, soft and limp in texture, attached by a very narrow ribbon to a much smaller, stiff, spoon-shaped base, which is studded with short purplish hairs. Within the circle made by the five spoon-shaped bases of the petals



*ABROMA AUGUSTA*

are five barren stamens, or staminodes, in colour whitish and purple, which alternate with five minute yellow anthers; and within the ring of staminodes are five small white styles. The fruit quickly develops into a large, green, leathery capsule with five pronounced wings, which taper towards the base and end squarely above with five sharp corners. Nearly a year after the opening of the flowers, the fruits, which by then have turned a dull brown colour, open at the top, and spread wide to release a number of seeds. The centre of the fruit consists of a mass of silky, whitish fibres which by springing apart serve to eject the seeds. The cottony appearance of the open fruits has no doubt given rise to one of the plant's English names, but the reason for its diabolic association is less obvious.

This tree is a native of Malaya and possibly of India also, though it is generally thought to be an escape from cultivation in the various parts of the plains where it is now established in scrub forest and thickets. It is sometimes grown in gardens, but probably more as a curiosity than as an ornamental plant, though Firminger remarks that the character of gloom that pervades the plant contrasts pleasingly with the other gay things of the garden. Certainly the pale chocolate-coloured, eardrop-like flowers, with their delicate petals, are attractive, and the huge leaves of the young plants would be a handsome addition to any collection of shrubs.

The bark contains a strong silky fibre which has been used for cordage, and the plant has been recommended as a source of a substitute for hemp. But experiments have shown that the cost of extracting the fibre, which must be done by retting, is too high, and the plant does not now seem to be cultivated anywhere for this purpose. It is, however, grown for its medicinal properties, the root-bark being used as an emmenagogue, and for this reason it is not uncommonly planted in Bengal villages. A number of plants may be seen in the neighbourhood of Behala, south of Calcutta.

The timber is soft and useless. The plant is easily propagated by cuttings.

The flowers appear during the rains, and the fruits ripen during the ensuing cold and hot seasons.

# TILIACEAE

A family of about 35 genera and 380 species of trees, shrubs and herbs, mostly natives of the tropics. The leaves are not arranged in opposite pairs, are often lobed, but never divided into separate leaflets. The flowers are usually small and bisexual, with 5 sepals and 5 white or yellow petals. The stamens are numerous, and either quite separate or joined in 3 or 5 bundles; each anther has 2 pollen-cells. The fruits take various forms.

**GREWIA.** (Named after Nehemiah Grew of Coventry, the author of a work on the anatomy of plants, 1628-1682.) A genus of over 100 species of trees and shrubs, of tropical and subtropical countries from Africa to Australia. The leaves are toothed, and usually more or less unequal-sided at the base. The sepals are separate and distinct, and the petals have a thickened or glandular appendage at the base. The fruit is a berry, often deeply lobed, and containing 1 to 4 seeds.

About 30 species are found in India, and 6 in the plains of Bengal. *Grewia multiflora* Juss. (Bengali, *pani sara*) is a large evergreen shrub often used to form hedges, and not uncommon in the neighbourhood of Calcutta. It resembles *G. glabra* Bl. (see next page), but differs in having smaller leaves not exceeding 4 inches long by 1¼ inches wide, and smaller flowers less than ¾ inch across. The sepals of *G. multiflora* do not exceed ⅓ inch in length but those of *G. glabra* are at least ½ inch long. The flowers of *G. multiflora* are produced from June to October and the leaves are renewed in the hot weather. The fruit consists of two small berries conjoined, which turn black when ripe. The plant is said occasionally to attain the size of a small tree.

**Grewia subinaequalis** DC. *Syn.* G. asiatica *Linn.*

(Asiatica means "from Asia". Subinaequalis means "rather unequal").

| | |
|---|---|
| English, | *dhamani, phalsa, sukri.* |
| Hindi. | *pharsa, dhamin, bimla, dhamani, phalsa, karra, pharoah, shukri, phulsa.* |
| Urdu, | *phalasah.* |

(F.I. p. 431. F.B.I. Vol. I p. 386. B.P. Vol. I p. 283.)

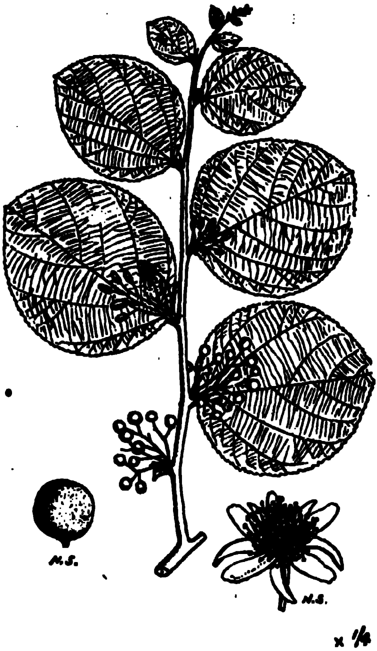
Leaves alternate, broad-cordate to obliquely ovate, tomentose, coarsely and irregularly toothed, 2 to 7 inches long; petiole ½ inch, thickened at the top; peduncles axillary, in fascicles of 2 to 10, from ½ to 2 inches long, each bearing 3 to 5 flowers; sepals ¼ inch to ½ inch long; petals ⅛ to ¼ inch long, yellow, or red and yellow, not bifid; stamens orange; stigma with 4 short lobes; fruit globose, indistinctly lobed, pilose, about ¼ inch diam.

This is a small tree, or a large straggling shrub, rather resembling the English hazel in its foliage and habit. The leaves are variable in shape but are always wide and pointed with toothed margins, and are usually broadly heart-shaped with an unequal-sided base. They are arranged close together in one plane on either side of the rather long, straight twigs. The leaf-stalks are short, and the young leaves are often pink or reddish in colour. The yellow or orange flowers are borne in numerous small clusters in the axils of the leaves. The fruit is a red or purple berry about the size of a pea, thinly covered with long fine hairs and containing one or two seeds. The bark is rough and grey.

The fruit is very acid and is used for making a pleasant cooling drink. From it a spirit is sometimes distilled, and it has various medicinal qualities, being specially valued as a tonic and as a cure for heart and chest troubles. The root-bark is used by the Santals to cure rheumatism, and the leaves are applied as a remedy for certain kinds of skin diseases.

A fibre is sometimes extracted from the bark and is made into ropes. The timber is light, strong, and elastic, and is much prized for purposes where combined lightness and strength are required: its weight is about 43 lb. to the cubic foot. The bark is, or used to be, employed to clarify sugar.

This very variable tree is believed to be a native of the the north-west of India, but is now generally cultivated for its fruit throughout the country, except in the Gangetic plain and East Bengal, where it is not very common. It is often planted near Calcutta in gardens and near villages.



*GREWIA SUBINAEQUALIS*

The flowers appear in March or April together with the new leaves. The fruits ripen soon after.

**Grewia glabra** Bl. *Syn*: G. disperma *Rottl.* G. laevigata *Vahl.* G. didyma *Roxb.*

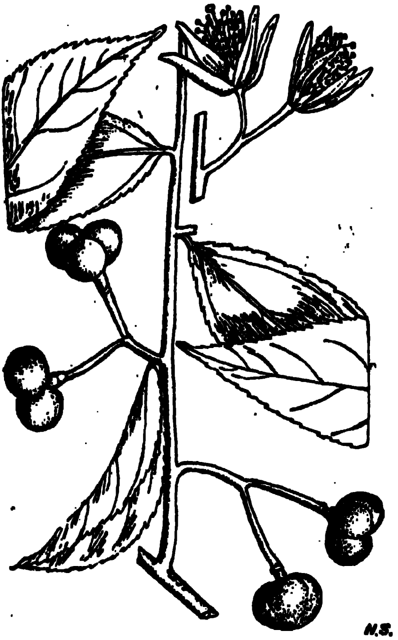
(Laevigata is Latin meaning "smooth", probably with reference to the leaves. Glabra means "hairless".)

| | |
|---|---|
| Bengali, | *kath bimla.* |
| Hindi, | *kath bewal, bhimul, kakki.* |

(F.I. p. 432. F.B.I. Vol. I. p. 389. B.P. Vol. p. 283.)

Leaves alternate, elliptic, acuminate, membranous, finely serrate, shining, nearly glabrous, distichous, 3 to 6 inches long; petiole ¼ to ½ inch long; flowers in axillary cymes of 3 to 5 flowers; sepals ⅓ to 1 inch long, greenish white; petals 1/6 inch long, white; stamens numerous, yellowish-white; drupes usually didymous or 4-lobed, green; drupels about ¼ inch diam.

This is a small tree or a large straggling shrub, with thin, dark grey bark. The leaves are narrow, pointed, and shining with finely toothed edges, and are borne on short stalks in two rows on either side of the slender twigs. The teeth situated towards the base of the leaves are converted into minute cup-shaped glands. The inconspicuous greenish flowers grow several together on short stalks springing from the axils of the leaves. The fruit consists of one or several small, hard, smooth green berries, which, if more than one, are joined together near their base.



*GREWIA GLABRA*

The wood is rather soft but close-grained, weighing about 36 lb. per cubic foot. It is white when freshly cut, but turns yellow and then brown. A useful cordage fibre is said to be obtainable from the bark, and the leaves are lopped for fodder.

The tree is a native of the outer Himalayas and most of peninsular India. It is occasionally found in village shrubberies near Calcutta, but probably only south and west of the city.

The flowers appear from June to October. The foliage is nearly evergreen, the leaves being renewed during the hot season. The fruits ripen in the cold weather.

**MUNTINGIA.** (After A. Munting, a German physician and professor of botany at Goetingen, 1626-83). This is a genus containing a single species, a native of tropical America. The leaves are toothed and unequal-sided. The flowers grow singly on long stalks, 1 or more stalks being borne together just above a leaf. The petals have no spur or other attachment, the ovary has 5 cavities, and the fruit is a berry containing many seeds.

**Muntingia Calabura** Linn.

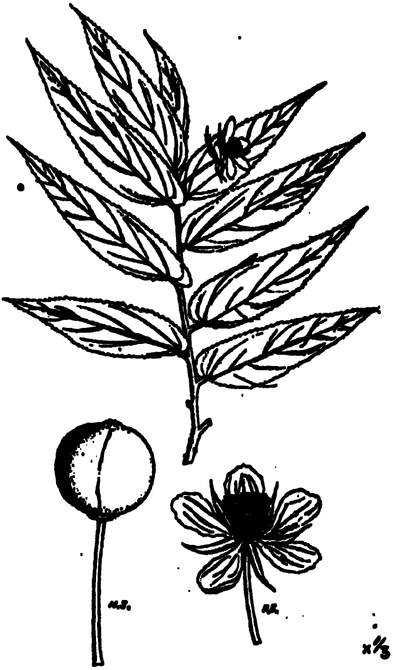
(Calabura is a West Indian name).

English, *Chinese cherry, Japanese cherry.*

(Not mentioned in F.I., F.B.I., and B.P.)

A small spreading tree or shrub; branches droo[illegible]g, pubescent; leaves distichous, obliquely lanceolate, acute, serrate, su[illegible]labrous above, silvery-tomentose below, about 3 inches long; petiole ¼ inch long; flowers solitary on extra-axillary peduncles, 1 inch diam.; peduncles 1 inch; sepals 5, linear-lanceolate, acuminate, ¼ inch long; petals obcordate, white, ½ inch long; stamens many; stigma 5-lobed; ovary ovoid, glabrous; berry globose or obovoid, ½ inch long; seeds many, in juicy pulp.

This shrub or small tree has wide-spreading branches, which often droop downwards so that the outermost twigs almost touch the ground. The narrow, pointed leaves are unequal-sided, and are arranged on very short stalks in one plane on opposite sides of the branches; on their upper sides the leaves are smooth, but the lower sides are covered with silvery grey down. The small white flowers are borne singly on long stalks which spring from the branches above the leaf-stalks. The petals last for one day only, after which they fall to the ground. The fruit is a smooth red berry, which closely resembles a cherry externally though unlike a cherry it contains a large number of minute seeds embedded in watery pulp.



*MUNTINGIA CALABURA*

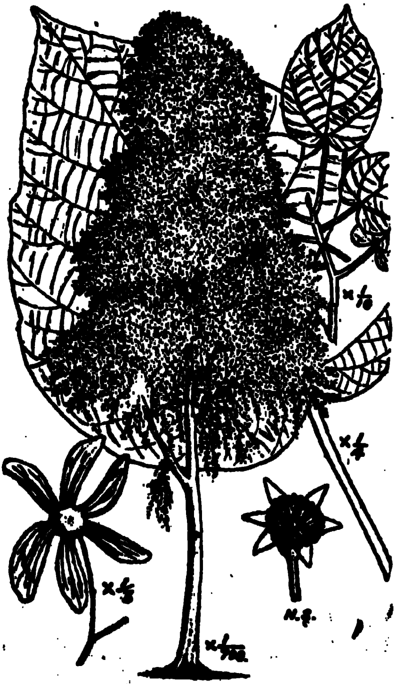
This plant is a native of America, but is cultivated in most parts of tropical Asia. It has only been introduced into Bengal within recent years but it is now very common in Calcutta gardens. Its growth is remarkably rapid, and its evergreen foliage combined with its graceful dwarf habit makes it an excellent ornamental tree for lawns, though it must be remembered that scarcely any plant will grow under its dense shade. The white flowers are attractive, but not numerous enough to be showy. The red fruits have a curious musty flavour which is said to be highly thought of in China, and they are stated to make good tarts and jam. In the West Indies an infusion of the leaves is used as tea.

The flowers and berries appear almost all the year round. The berries are very attractive to fruit-eating birds.

**BERRIA.** (Also spelt "berrya". Named by Sir William Roxburgh after Dr. Andrew Berry, a botanist of Madras, "to whose ability and industry the Botanic Garden at Calcutta is much indebted"). A genus containing a single species distinguished by sepals joined to form a cup at the base, the absence of barren stamens (staminodes), and fruits with 6 wings. The leaves are broad and have almost smooth edges.

**Berria cordifolia** (*Willd.*) *Burret.*
(Cordifolia means "with heart-shaped leaves.")
English, *Trincomali wood.*
(F.I. p. 447. F.B.I. Vol. I. p. 383. Not in B.P.)

A large tree; leaves alternate, cordate, slightly scolloped, acute, nearly glabrous, bright green, 4 to 8 inches long, 5- to 7-nerved at the base; petiole 2 to 4 inches long, slender, round, smooth; flowers in large lax terminal panicles; calyx 1/6 inch long, downy, irregularly lobed; petals 5, spreading, linear-oblong, white, about ½ inch long; stamens many, free, half the length of the petals; capsule borne on the persistent calyx, rounded, 6-winged, 3-celled; wings papery, blunt, horizontally spreading, 1 inch long; seeds 1 to 4 in each cell, pilose.



*BERRIA CORDIFOLIA*

This tall evergreen tree has a straight trunk covered with fairly smooth, light brownish-grey bark, and a spreading crown of shady foliage. The broadly heart-shaped, bright green leaves are crowded on long stalks near the ends of the twigs; they have pointed tips and slightly indented edges with broad, shallow recesses alternating irregularly with slight projections. At the ends of the branches the rather small flowers are borne in loose clusters; each flower has five narrow, white, spreading petals, within which are a large number of much shorter stamens ending in golden-yellow anthers. The fruits are borne in profusion, each consisting of a roundish capsule set with six spreading papery wings and containing from three to twelve seeds, which are covered with short stiff hairs. These hairs readily penetrate the skin and cause intense irritation.

This tree is a native of Ceylon, Burma, the Andamans, and South India. In Ceylon it is one of the most important and common of timber trees, and wherever it is found it is much valued for its tough, flexible, and durable wood, which is rather apt to split but is very hard and close-grained. The wood is dark red in colour and weighs about 62 lb. per cubic foot ; even when old it has a smooth, rather damp oily feel and a characteristic odour. It is used for building purposes, carts, agricultural implements, and in Madras for making *masula* boats. A coarse fibre can be obtained from the bark.

In Calcutta the tree has been planted here and there for ornament. A specimen grows (in 1944) on the north side of Lower Circular Road, west of its junction with Chowringhee, and another near the entrance gate of the Tollygunge Club.

The flowers appear in the hot season and sometimes give a fairly attractive show. The fruits ripen during the rains and are conspicuous from August to November, when they are borne in masses at the ends of the twigs ; they are greenish at first, but turn reddish and finally brown.

## OXALIDACEAE

This is a family of 7 genera with about 250 species, mostly herbs of tropical and subtropical countries, but including a few trees. The leaves are not arranged in opposite pairs, and are usually divided into separate leaflets. The flowers are bisexual, with 5 sepals and 5 petals. The stamens number 10, in two whorls of 5, and are joined near the base. The ovary has 5 cavities (cells) and 5 distinct styles. The fruit is a capsule which splits open by 5 seams, or a berry.

This family takes its name from the genus *Oxalis* which includes *Oxalis corniculata* Linn. (Bengali, *amrul* ; English, *procumbent oxalis*), a small herb with yellow flowers, which is one of the few plants found wild both in England and in lower Bengal ; it also includes *Oxalis Acetosella* Linn., the English wood-sorrel.

The *Oxalidaceae* are united by some authorities with *Geraniaceae*, a large family of herbs which included the genus *Pelargonium* (the so-called "geraniums" of gardens). These differ from *Oxalidaceae* chiefly in their fruits, which have 5 separate one-seeded divisions (carpels).

**AVERRHOA.** (Named after Averrhoes, a famous Arabian physician). This is a genus of 4 or 5 species of trees, all natives of the New World, of which 2 species are now cultivated in many hot countries, probably having been introduced by the Portuguese. The leaves are imparipinnate, i.e., divided into separate leaflets arranged in two rows on the central midrib with a terminal leaflet at the end. The trees are said to be sensitive to being touched, and to show signs of reflex movements when disturbed. The fruits are fleshy, and contain numerous small seeds.

**Averrhoa Carambola** Linn.

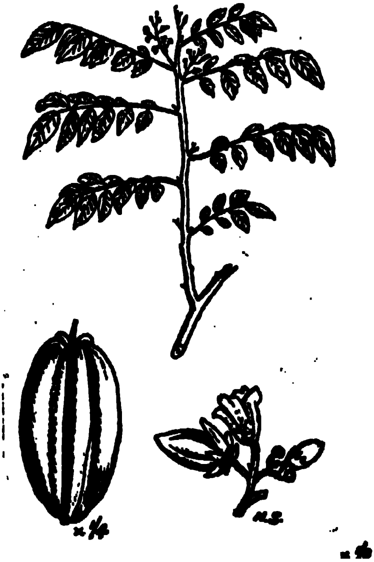
(Carambola is a Spanish name).

| | |
|---|---|
| Bengali, | *kamarak, kamranga.* |
| Hindi, | *kamrak, kamaranga.* |
| Urdu, | *kamarakha.* |
| English, | *karambola apple, Chinese gooseberry, Coromandel gooseberry.* |

(F.I. p. 387. F.B.I. Vol. I. p. 439. B.P. Vol. I. p. 296.)

Leaves alternate, imparipinnate; leaflets 5 to 11, ovate, acuminate, glabrous, subopposite, 1½ to 3 inches long, those nearest the base the smallest; flowers in small panicles from the branches and trunk; corolla ½ inch diam., campanulate, variegated white and purple; stamens 10, of which 5 are shorter and without anthers; fruit ellipsoid with 5 prominent ridges, up to 3 inches long, yellowish.

This is a small tree with rather smooth, dark grey bark, and close, drooping branches. Its foliage is very ornamental, the leaves being divided into smooth, pointed leaflets placed in two rows on either side of the central midrib, with one terminal leaflet at the apex of the leaf, the arrangement being unusual in that the pairs of leaflets are not quite opposite. Many small, bright purple and white flowers are borne in short-branched clusters along the twigs, and also from the main trunk, sometimes not far above the level of the ground. The narrow, pointed fruit has five pronounced ridges or angles, and is yellowish, or sometimes a rich amber colour when ripe, with a semi-transparent appearance.



*AVERRHOA CARAMBOLA*

The fruit before it is ripe tastes rather like a green gooseberry, but when ripe has a strong scent like that of a quince, and an acid but very pleasant flavour. It is almost too sour to be eaten raw, but is cooked in stews and tarts, and made into preserves. The pulp of the fruit is used to make a very delicious jelly and a pleasant drink. The juice is useful for removing stains from linen, and is often employed for polishing brass.

The ripe fruit is used medicinally to allay haemorrhages and other internal disorders. The dry fruit is given in fevers. In Assam twigs of this tree are kept in houses in the belief that they keep off measles.

A variety of the tree has sweet fruits, but those are almost entirely devoid of the fine flavour of the acid variety. The sweet variety is known as *chini kamranga,* and is always propagated by grafting on stocks of the acid variety.

The timber is fairly hard and close-grained, weighing about 38 lb. per cubic foot. It is used for building purposes and for furniture.

The tree is probably a native of America, but is now cultivated in most hot countries. It is occasionally found in gardens and villages near Calcutta. Two good specimens are to be seen in the Agri-Horti. Gardens at Alipore.

The flowers appear chiefly from April to June, but continue intermittently throughout the rains. The fruits ripen chiefly in September, but are also found at other seasons.

**Averrhoa Bilimbi** Linn.

(Bilimbi is an Indian vernacular name).

| | |
|---|---|
| Bengali, | *bilimbi, blimbi.* |
| Hindi, | *belambu, bilimbi.* |
| English, | *bilimbi, blimbing, cucumber tree.* |

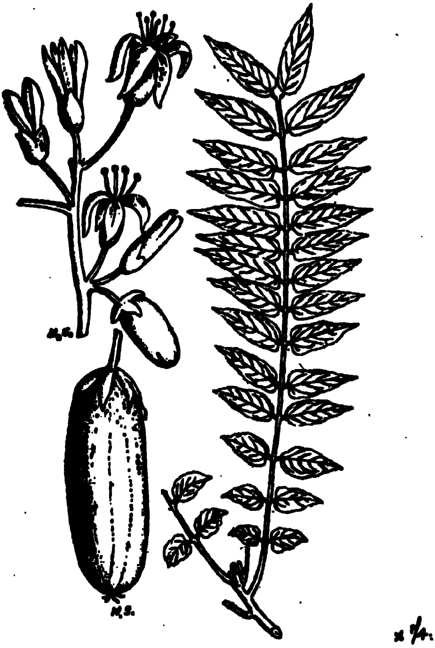
(F.I. p. 387. F.B.I. Vol. I. p. 439. B.P. Vol. I. p. 296).

**Leaves alternate, imparipinnate, sometimes appearing paripinnate owing to the loss of the terminal leaflet; leaflets 13 to 35, narrow-oblong or lanceolate, acuminate, pubescent beneath, 1½ to 2 inches long; flowers in panicles from trunk and old branches; inflorescence and calyx rusty pubescent; corolla crimson or brownish purple, ¼ inch long; fruit yellow, oblong, with 5 rounded, shallow lobes, up to 4 inches long.**

This small tree or shrub sometimes branches from ground-level but usually has a single rather short trunk. Its handsome, bright green leaves are long and thin in outline and are divided into many narrow pointed leaflets, which are arranged in opposite, or nearly opposite, pairs on either side of the slender midrib, usually with a terminal leaflet at the tip. The small red or purplish flowers are borne in short branching clusters from the main trunk and the larger branches, sometimes only just above ground-level. The fruits are almost of the shape and size of a gherkin, with a smooth, thin, yellow or pale green skin like that of a white grape; they hang by very thin stalks in clusters, chiefly from the trunk of the tree, and often very near the ground.

The fruit is soft when ripe and has a flavour something like a green gooseberry. When kept for a short time it is said to have a strong scent of strawberries, but without their flavour. The fruit is too sour to eat raw, but is much used for making preserves and pickles, and occasionally for jam and cooling drinks. It is also much eaten in curries. The juice is used to remove iron-mould stains from linen. According to Sir George Watt the flowers too are sometimes made into preserves.

The timber is white, tough, and even-grained, but soft; its weight is about 35 lb. per cubic foot. A syrup made from the fruit is employed medicinally to cure internal haemorrhages, and occasionally as a remedy for fever and inflammations. The fruit is regarded as a useful remedy for scurvy.



*AVERRHOA BILIMBI*

The tree is thought to be a native of the Moluccas, but is now widely distributed in the tropics. It is commonly cultivated in India, and is often found in Bengal villages and gardens, where it occasionally appears to run wild.

The flowers appear in the early hot weather and continue till the end of the rains. The main crop of fruit is found about the beginning of the cold weather.

# RUTACEAE

A family of about 100 genera with 800 species, mostly shrubs and trees, natives of tropical and temperate countries, and especially South Africa and Australia. The plants abound in glands full of essential oil. The leaves are usually divided into separate leaflets, and are covered with minute transparent dots. The flowers usually have 5 petals and 5 sepals, but occasionally only 3 of each. The stamens usually number 4 to 5, or 8 to 10, and are inserted on the outside of an annular or cylindrical disk; but in the case of the genus *Citrus* the stamens number 20 to 60 and are joined in bundles. The fruits are very variable in form.

The family takes its name from the genus *Ruta* which includes *Ruta graveolens* Linn., the common rue, a well-known undershrub used as a pot herb. About 24 genera of the family are represented in India. Included in the family is *Glycosmis arborea* (Roxb.) Correa. (Bengali, *ashaura*), a very common plant in waste places and on roadsides in Bengal; it usually takes the form of a small shrub, but is said sometimes to grow into a low tree, though probably not in the damp climate of Bengal. It has leaves divided into pointed, toothed leaflets, usually numbering 5, minute whitish flowers in branching clusters, and smooth berries as big as a pea. The family also includes *Atalantia monophylla* DC. (*Syn. Limonia monophylla* Roxb.), a large shrub with shining, blunt, aromatic leaves about 1½ inches long, and small clusters of white, scented flowers very like orange-blossoms, but smaller; this plant is indigenous in South India and is occasionally grown in Bengal gardens; the flowers open in the rains.

**MURRAYA.** (After J. A. Murray, a professor at Gottingen, 1740-91). A genus of 5 species of shrubs and small trees, natives of tropical Asia, of which 2 are found in India. The leaves are divided into separate leaflets alternately arranged on either side of a central midrib, with a terminal leaflet at the apex. The flowers are hermaphrodite with 5 petals which overlap each other, and 10 stamens. The ovary is surmounted by a style which soon falls off, and the fruit is a berry containing 1 or 2 seeds only.

**Murraya paniculata** (Linn.) *Jack. Syn.* M. exotica *Linn.* Chalcas paniculata *Linn.*

(Exotica in Latin means "of foreign origin". Paniculata in Latin means "having panicles, or tufts, of flowers").

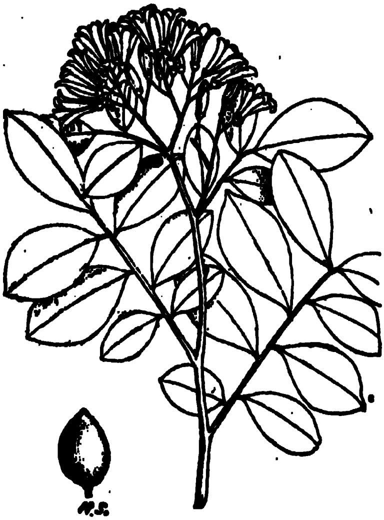
| | |
|---|---|
| Bengali, | *kamini.* |
| Hindi, | *marchula, juti, atal, bibsar.* |
| English, | *Chinese box, Sumatra box, satin wood, orange jasmine.* |

(F.I. p. 362. F.B.I. Vol. I. p. 502. B.P. Vol. I. p. 302.)

An evergreen shrub, or small tree; leaves imparipinnate; leaflets alternate, usually 5 to 7, often obovate, glabrous, shining, ½ to 3 inches long; flowers in short corymbs, campanulate, white, fragrant, 1 inch long; berries ½ inch long, red, acuminate, 2-seeded, ellipsoid-apiculate, seated on the persistent calyx.

This is a large shrub or small tree, with grey bark, and dark green shining leaves divided into small leaflets, which are arranged alternately (*i.e.*, not in opposite pairs) on either side of a midrib, with a terminal leaflet at the tip. Many white, scented flowers are borne in small dense clusters at the ends of the branches and from the axils of the leaves. The fruits consist of red, more or less egg-shaped berries, which are pointed at both ends.

The appearance of this plant, except for its flowers, is reminiscent of the European box tree (*Buxus sempervirens* Linn.), and the resemblance extends to its timber, which is close-grained and very hard. It has been used for wood engraving and is often made into handles for tools and walking sticks. In Burma the bark is made into cosmetics, and in some places it is considered to be a cure for snake-bite. The leaves and other parts of the plant are valued as a remedy for dysentery. The twigs are often employed for cleaning the teeth, and in Assam a thick gum obtained by burning the green wood is used for blackening the teeth of women.



*MURRAYA PANICULATA*

There are two main varieties of this plant, one shrubby with many flowers in each cluster, and the other growing to the size of a tree with smaller clusters of flowers. Both varieties are commonly planted near Calcutta for their delicate foliage and their attractive scented flowers, which are found throughout the hot weather and rains. The shrubby variety is sometimes used to form hedges.

The plant is indigenous throughout the hotter parts of India, and in Malaya, China, Polynesia and Australia.

Hindus use the flowers in religious ceremonies, especially in the worship of Krishna and Durga.

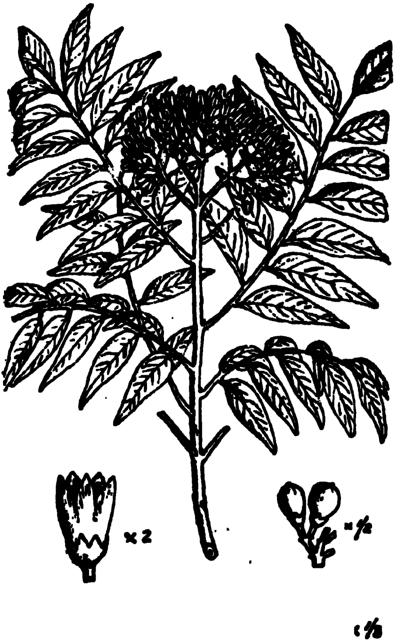
**Murraya Koenigii** Spreng. *Syn:* Bergera Koenigii *Linn.*

| | |
|---|---|
| Bengali, | *barsanga, kariaphulli.* |
| Hindi, | *harri, katnim, barsanga, gandhela, gandhla.* |
| English, | *curry-leaf tree.* |

(F.I. p. 362. F.B.I. Vol. I. p. 503. B.P. Vol. I. p. 302.)

A small pubescent tree; leaves narrow, imparipinnate, often 1 foot long; leaflets alternate, 11 to 25, crenulate, ovate-lanceolate from an oblique base, 1 to 1½ inches long; flowers in terminal corymbose panicles, white, subcampanulate, ½ inch long; stamens 10, alternately longer, filaments dilated below; fruit ovoid or subglobose, about 1 inch long by ½ inch diam., rugose, purplish-black when ripe.

This small tree has a short trunk and a dense, shady crown, which is leafless for a short time at the end of the cold season. The long and slender leaves are divided into numerous leaflets, which are usually rather narrow and pointed and are arranged alternately on either side of a midrib with a terminal leaflet at the tip. The edges of the leaflets are minutely notched, and the whole leaf is very like that of the neem (*Azadirachta indica*). Many small white flowers are borne in broad clusters at the ends of the branches. The fruits are pointed, wrinkled berries, more or less spherical in shape, greenish-white with dark spots when ripening and almost black when ripe. Most parts of the plant are covered with fine down, and the whole has a strong and peculiar smell.



*MURRAYA KOENIGII*

The pungent, aromatic leaves are a common ingredient in curries, chutney, etc., for which purposes they are used either fresh or dry. The leaves are also valued as a cure for dysentery, and are bruised and applied externally as a remedy for skin troubles and contusions. The bark and roots are given as stimulants, and are applied externally to cure the bites of poisonous animals and snakes.

The wood is hard and durable, weighing about 43 lb. per cubic foot. It is used for agricultural implements.

The tree is a native of the foot of the Himalayas, and most of the hotter and damper parts of India and Ceylon. It is occasionally planted in villages and gardens near Calcutta.

The flowers appear with the new leaves in February or March, and are often produced when the plant is no larger than a shrub. The fruits ripen in June.

**CITRUS.** (Originally the ancient name of a fragrant African wood, afterwards transferred by the Greeks to the citron). A genus of evergreen trees and shrubs, natives of Asia, of which several forms are found wild in various parts of India. The leaves consist of a single leaflet, but there are often wings on each side of the leaf-stalk, which are sometimes wide enough to give the appearance of a small leaflet at the base of the main leaf. The branches are often armed with spines. The sweet-scented flowers have a cup-shaped calyx, and 4 or 5 petals, usually white. The stamens number from 20 to 60, and are more or less joined together in bundles, which surround a large disk on which the ovary rests. The fruits have leathery rinds full of aromatic essential oil, and contain from 9 to 15 segments (carpels) divided by thin membranes holding numerous small vesicles filled with sweet or acid, juicy pulp. Each cell contains a number of oval or oblong seeds.

A great diversity of plants of this genus is grown, in India as in all warm countries, not only for their fruits but also as ornaments in gardens, for which purpose their glossy foliage, scented flowers, and handsome fruits, make them eminently suitable. The nomenclature of these plants has been frequently changed by various authorities, and it is by no means easy to assign all the wild and cultivated forms to definite botanical species. A useful account of the varieties best known in India will be found in "Firminger's Gardening in India" (Thacker Spink & Co., 1930), and a concise, but out-of-date, scientific note on the subject may be seen in Brandis' "Forest Flora of North-West and Central India" (1874). Dr. Bonavia's "The Cultivated Oranges and Lemons of India and Ceylon" (1890), gives an exhaustive description of many forms but scarcely helps to classify them in any systematic way. The shape, texture, taste, and scent, of the fruits of different forms are often quite distinct, but these characters do not usually seem to be reliable guides to the classification of the genus. The nomenclature adopted below is based on the publications of Mr. Tyozaburo Tanaka, a Japanese botanist who at the time of writing is the acknowledged authority on the subject. He has recognised a large number of species, but it seems possible that further study will result in the reduction of many of these species to the status of varieties, thereby approaching the views of the earlier authorities. It may even be decided that all these plants belong to one very variable species which has been much modified by cultivation in various parts of the world.

The following key may help to identify the commoner kinds cultivated in India:—

1. Young shoots and undersides of young leaves minutely hairy; leaf-stalks mostly broadly winged; fruit normally over 5 inches broad; vesicles of pulp loose. *C. grandis.* The pumelo or shaddock.

1. Young shoots and undersides of leaves quite hairless; leaf-stalks seldom with wings more than ½ inch wide; fruit very rarely more than 5 inches broad.

  2. Young shoots usually purplish; petals more or less pink or purplish outside; rind of fruit thick, soft and often uneven.

    3. Leaves very fragrant; leaf-stalk short, not winged; fruit usually less than 4 inches long, egg-shaped with a blunt projection at the apex. *C. Limon.* The Lemon.

    3. Leaves not highly scented, leaf-stalk sometimes with a broad wing; rind of fruit thick, soft and uneven, very fragrant; fruit large, variable and often irregular in shape. *C. medica.* The citron (many varieties).

  2. Young shoots green; petals pure white; rind of fruit thin.

    4. Fruits orange or reddish when ripe, very seldom longer than broad.

      5. Fruits over 2 inches diam. when ripe; large shrubs or small trees.

        6. Fruits concave at the apex; rind loose and easily detached with the fingers; seeds green within. *C. chrysocarpa.* The *suntara* or loose-skinned orange.

6. Fruits rounded at the apex; rind tight, scarcely detachable without a knife; seeds whitish within.
*C. sinensis*. The sweet, or tight skinned orange.

5. Fruits about 1 inch diam.; small or medium-sized shrubs.
*C. microcarpa*. The *hazara* or calamondin.

4. Fruits green or yellow when ripe, often longer than broad.
7. Pulp of fruit very acid, aromatic.
*C. aurantifolia*. The sour lime.

7. Pulp of fruit sweet, not aromatic.
*C. limettioides*. The sweet lime.

In addition to the above, several wild plants are grown locally for their fruits, and there are a number of distinct cultivated forms to be found in various parts of India, though most of these are of local importance and produce inferior fruits. The trees most frequently grown in lower Bengal, namely *C. grandis, C. medica, C. chrysocarpa, C. sinensis,* and *C. aurantifolia,* are fully described below. The other *Citrus* plants commonly cultivated in India are the following:—

1. Resembling *C. grandis*. (The pumelo).

*C. Paradisi* Macf. The grapefruit. Differs from *C. grandis* in the size and flavour of its fruits, and in the smaller size of all its parts. The young shoots are glabrous. The grapefruit grows fairly well in Bengal, and its cultivation is being extended in many parts of India.

*C. Natsudaidai* Hayata. Known in India as the Watson pumelo. An inferior type of orange, fruiting in the hot season. Fruits like a small, sour pumelo.

*C. rugulosa* Tanaka. The *atanni* of Northern India (so called because it is half the size of a pumelo). Leaves small, leaf-stalks with very small wings. Fruit pear-shaped, rind rough, pale orange in colour when ripe.

2. Resembling *C. chrysocarpa*. (The loose-skinned orange).

*C. deliciosa* Ten. The Mediterranean mandarin. A small tree with slender branches, narrow leaves, and nearly wingless leaf-stalks; flowers small; fruits flattened with a pronounced depression at the apex, reddish-orange; seeds small, beaked, bright green within. Cultivated in the U.P. and in the foothills of the Himalayas.

*C. tangerina* Tanaka. The tangerine of the U.S.A. Leaves much broader than those of *C. deliciosa;* fruit smaller; seeds abundant, beaked. Cultivated in Madras and the U.P., but the fruits are rather inferior.

*C. paratangerina* Tanaka. The *ladoo* of Poona and the Punjab. Leaves very broad, leaf-stalks not winged. Fruits much flattened with a pronounced projection at the base, orange-red; skin rough, very loose; pulp rather acid.

*C. crenatifolia* Lush. The *keonla* or *kawla* of the U.P. Closely resembles *C. paratangerina,* but the fruit is redder and less flat, and has a fine flavour quite distinct from that of *C. chrysocarpa*. The pulp-vesicles radiate from the centre of the fruit.

*Citrus Jambhiri* Lush. The *khatti* of the Punjab, and the *jam-bhiri* of other parts of India. The "Florida rough" of the U.S.A. Resembles *C. crenatifolia,* but the rind is yellow-orange when ripe, and there is little or no projection at the base of the fruit, but usually a projection at the apex. Juice very abundant, acid.

*C. Reshni* Tanaka. The *chhota kichli* of Madras, and the *reshni* or *reshmi* of Lucknow. Leaves very small. Fruits small, depressed at base and apex, reddish, like a small tomato. Rind loose, scented like *Lantana;* pulp rather acid.

*C. maderaspatana* Tanaka. The *kichli* of Madras. Plants very like *C. Aurantium*, the bitter orange; leaf-stalks broadly winged. Fruit slightly five-sided, with a depression at the apex and a small projection at the base; rind deep orange, smooth, scented like *Lantana;* pulp rather bitter, mucilaginous, peculiarly flavoured.

In addition *C. Unshiu Marc.*, the *satsuma* orange of Japan, is said to be grown in India. This is a dwarf tree with broad leaves abruptly narrowed at the apex and strongly marked with nerves on both surfaces. The fruits are deep orange in colour and have a peculiar flavour. The seeds are not beaked, and broadly top-shaped.

3. Resembling *C. sinensis*. (The tight-skinned sweet orange).

*C. Aurantium* Linn. The bitter, or Seville, orange. Leaf-stalks often broadly winged. Flowers large and very sweet scented. Fruit rather rough, globose or flattened, orange in colour; rind aromatic, very bitter and pungent; pulp acid. This plant is much cultivated in Mediterranean countries, chiefly for its flowers, from which oil of oranges is made. Other essences are obtained from the fruits and leaves, all being used in perfumery. Marmalade is made from the fruits. In many parts of India this orange is grown for its fruits, which are used for preserves and for medicinal purposes. It is said to be established as if wild in the Nilgiris and is cultivated in the Terai and Dooars, but is rarely seen in lower Bengal.

*C. Karna* Raf. The *khatta, karna*, or *id* of the north and west of India. A strong-growing spinous tree or shrub with dark green, serrate, small leaves and rather large flowers tinged with pink or purple on the outside like those of a citron or lemon. Fruit thick-skinned, warty and rough, usually spherical with a projection at the apex but sometimes elongated, orange in colour when ripe, rather small. Pulp copious, acid, rather bitter; rind scented like a lemon, orange in colour.

*C. pennivesiculata* Tanaka. The *gajanimma* of Madras, *bandhuri* of Coorg, and *attara* of the C. P. Leaves large and leathery with broadly winged stalks. Fruits rather large, thin-skinned, smooth, shining, clear lemon-yellow in colour, gathered into folds at the base and apex, usually rather broader than long. Pulp pale yellow, juice abundant, acid. The vesicles of the pulp are so arranged that if a segment of the fruit is cut transversely, the vesicles make a feather-like pattern. The fruits are mostly used for culinary purposes.

*C. megaloxycarpa Lush.* The *amalbed* of the north of India. Leaves broad and usually rounded at the apex, with narrowly winged stalks. Fruits smooth, pale yellow when ripe, variable in shape. Rind thin. Pulp pale orange-yellow, acid, very juicy. A rather rare plant.

*C. microcarpa* Bunge. The *hazara* of Benares, erroneously known as the kumquat* in Calcutta and other places. The calamondin of the Philippines. A shrub with almost thornless branches, small, bright green leaves, and almost wingless leaf-stalks. Flowers small, pure white, highly scented. Fruits about 1½ inches across, quite spherical, bright orange when ripe; rind thin; pulp orange, very juicy,

---

*The true kumquats are usually regarded as forming a distinct genus *Fortunella*, which differs from *Citrus* in having a hollowed-out stigma, only 3 to 6 cells in the ovary and segments in the fruit, and only 2 seeds in each segment. These plants are small shrubs with narrow, pointed leaves, white flowers with about 20 stamens, and fruits not more than 1½ inches wide, orange in colour when ripe, with rather thick skins. Two species are grown in India, viz. *F. margarita* Swingle, which has oval fruits, and *F. crassifolia* Swingle, which has nearly spherical fruits. *F. japonica* Swingle (*Syn. Citrus japonica* Thunb.), the round kumquat, seems to be scarcely known in India. These plants are principally grown for ornament, but in the Far East their fruits are much used for preserves. They do not flourish in most parts of India.

intensely sour and bitter. This plant is commonly grown in many parts of India (including Calcutta), as an ornamental pot-plant, and for its fruits, which are produced in great profusion during the cold season, and make excellent marmalade and preserves. It seems possible that this plant may prove to be of considerable economic importance in Bengal, because it grows there vigorously and is easy to propagate.

In addition to the above, a hybrid between *C. chrysocarpa* and *C. grandis*, which was developed in the U.S.A. where it was given the name of "tangelo", is sometimes grown in India, especially in the hills. The fruit of this hybrid resembles that of neither of its parents, but is like a large, smooth-skinned fruit of *C. chinensis* in outward appearance. The rind is rather loose, and the pulp resembles a rather acid grapefruit in flavour, but is darker in colour. The leaves are like those of *C. chrysocarpa*, but larger.

4. Resembling *C. aurantifolia*. (The sour lime).

*C. limettioides* Tanaka. The sweet lime (Bengali, *mitha nebu*). Usually a straggling shrub. Leaf-stalks not winged. Flowers pure white. Fruit almost spherical, smooth, pale yellow, depressed at the apex, rind very thin; pulp sweet, not aromatic, rather tasteless. The fruits ripen during the rains when other *citrus* fruits are scarce, and are then welcome in spite of their lack of flavour. The juice is regarded as a remedy for fever and jaundice. This plant is not uncommon in many parts of India and sometimes produces a good crop in Bengal. Near Delhi it is much used as a stock on which to graft loose-skinned oranges.

*C. Limetta* Risso. The *lumia* of Italy. Most authorities have considered this plant to be identical with the sweet lime (see above), but Tanaka considers them distinct, chiefly owing to the difference in the leaves, (those of *C. Limetta* resembling the leaves of *C. aurantifolia* but with wingless stalks), and also owing to the thick oily rind of *C. Limetta* and the distinct flattened area at the apex of the fruit. The *lumia* is only occasionally grown in India.

*C. Limonia* Osbeck. The Rangpur lime, grown in various parts of India under several vernacular names. The Japanese citron of Java, and the tangerine lime of the U.S.A. A shrub with a few small thorns. Fruits usually near spherical, pale orange or yellow when ripe, about 2 inches wide; rind thin, without the "lemon" scent of *C. Limon*; pulp pale and usually acid, like that of a lemon, but a sweet variety is also known.

*C. macroptera* Mont. *var. Combara* (Raf.) Tanaka. The *soh quit* or *soh quid* of Assam; also found in other parts of northern India. A peculiar plant with almost round leaves, and leaf-stalks so broadly winged as to approximate the blades of the leaves in size and shape. Thorns many and strong. Fruits small, usually flattened, very acid; used for making drinks, for which purpose they are stored and consumed when other citrus fruits are not available. This may be the same plant as *C. Hystrix* DC. (*Syn. C. ichangensis* Swingle), a native of the hills of Assam, where it is sometimes cultivated, but the leaves of the latter plant are said to be narrower, and the fruits of cultivated plants larger, than those of the soh quit.

5. Resembling C. *medica*. (The citron).

*C. Limon* Burm. The lemon. (Bengali, *karna nebu, gora nebu, bara nebu;* Hindi, *jambira, pahari nimbu*). A straggling thorny shrub, with broad leaves and very short wingless leaf-stalks. The leaves are usually highly scented with the well-known lemon odour and with pale dots marking the position of oil glands. The flowers are pink or purplish on the outside of the petals, a character which they probably share with *C. medica* and *C. Karna* only. The fruits vary considerably in shape and flavour, but are almost always more or less egg-shaped with a pronounced blunt projection at the apex, and pale yellow when ripe. The thick rind yields a valuable essential oil, and the pale, acid pulp is much used for making drinks and for flavouring. Lemons are much cultivated in most parts of India, and grow fairly well in lower Bengal. A form of this plant is found wild at Almora. The rind, essential oil, and juice are used for various medicinal purposes, particularly in the treatment and prevention of scurvy. A number of varieties are known, some of which approach close to the citron, and a form with variegated leaves is grown in gardens.

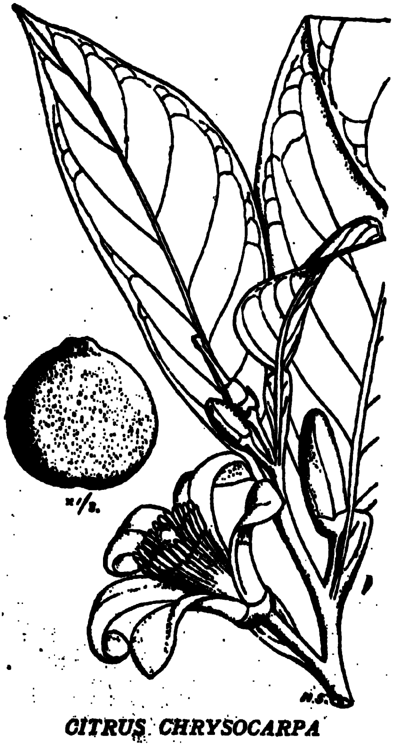
**Citrus chrysocarpa** Lush. *Syn.* C. Khasia *Marc.*

(Chrysocarpa is from the Greek "chrusos", gold, and "karpos", a fruit. Khasia is after the Khasi hills, where this species is grown.)

| | |
|---|---|
| Bengali, | *kamala, kamala nebu.* |
| Hindi, | *sontara, santara, narangi, naranj.* |
| English, | *loose-skinned orange.* |

(F.I. p. 590. F.B.I. Vol. I. p. 515. B.P. Vol. I. p. 307.)

A bushy, evergreen, glabrous tree; young shoots greenish-white; leaves elliptic, subacute, usually emarginate at the tip, up to 6 inches long, petiole short, wings linear; flowers bisexual; calyx truncate, shallowly toothed; petals 4 or 5, waxy-white; stamens 20 to 40, inserted round a disk; style equalling the stamens; fruit globose, depressed at the apex, deep orange in colour with minute dots; rind thin, brittle, easily detached; pulp orange-coloured, very sweetly-flavoured; vesicles large; seeds few, small, smooth, light straw-coloured, yellow-green within.



*CITRUS CHRYSOCARPA*

This is the most important commercial orange of India, and is the fruit which is chiefly on sale in the markets of Calcutta, though it is not much grown in the plains of Bengal. In favourable climates the plant attains a height of 20 feet or more, and forms a handsome tree with many, usually thorny, branches and dark, greenish bark. Its dense, evergreen foliage consists of deep-green, glossy leaves set on short, almost wingless, stalks. The leaves are pointed at both ends, and usually have a very small notch at the apex. The highly scented white flowers grow on short stalks among the leaves, singly or in small clusters; they are smaller than the flowers of most of the other species of *Citrus*, and have small calyces with very short teeth. The fruit is so well-known that it scarcely needs description, its peculiarity being the thin, brittle, loose rind, which is easily removed with the fingers from the ripe fruit. The end of the fruit opposite the stalk is always more or less concave. The pulp is highly flavoured, and very sweet when the tree is grown under favourable conditions. The interior of the seed is greenish.

This orange is only occasionally grown in the neighbourhood of Calcutta because it seldom, if ever, produces good fruit in the hot, wet climate of lower Bengal. Various varieties of this species are much grown in the Shillong, Darjeeling, and Chota Nagpur hills at an altitude of about 2000 feet, as well as near Nagpur and in various other parts of India. Large quantities of these fruits are marketed in Indian towns, where they are an important food in the cold season and the early part of the hot season. The trees flower mainly from December to May and ripen their fruits in the following cold season.

In addition to its value as a fruit tree, this plant has several uses in medicine, but no distinction between this species and *C. sinensis*, the tight-skinned sweet orange, appears to have been made by those interested in their medicinal properties. It seems probable that *C. sinensis* is more usually employed for these purposes, and a brief mention of them is made under the description of that species below. The wood is also described under the heading of *C. sinensis*.

A number of other forms of *Citrus* closely allied to *C. chrysocarpa* are found in India. A brief account of the more important of these is given above under the description of the genus.

**Citrus sinensis** Osbeck. *Syn.* C. Aurantium *Lour non Linn.*

(Sinensis means "Chinese". Aurantium is an old name for the orange, from the Latin "aurum", gold.)

| | |
|---|---|
| Bengali, | *kamala nebu, kamala, narungi, naranga.* |
| Hindi, | *narangi, naringhi, naranj, keonla.* |
| English, | *tight-skinned orange, common orange, sweet orange.* |

The Indian vernacular names of this fruit-tree are much confused.

(F.I. p. 590. F.B.I. Vol. I. p. 515. B.P. Vol. I. p. 307).

A spreading evergreen glabrous tree; young shoots greenish-white; leaves ovate, acute, up to 6 inches long; petiole narrowly winged; flowers bisexual; calyx large, irregularly 5-lobed, lobes acuminate, acute; petals 4 or 5, waxy-white; stamens 20 to 25; fruit globose, rounded at the apex, golden-yellow or orange when ripe; rind fairly thick, tightly adherent; pulp yellow, orange, or reddish, fairly sweet or acid; seeds large, smooth, white within.

This is the species most widely cultivated in the principal orange-growing countries of the world, but in India it is second in importance to *C. chrysocarpa*, the loose-skinned orange (see above). Many varieties are known in India, as in other countries, and several of them are widely distributed in various parts of the country ; but in the damp climate of lower Bengal the fruits never reach perfection and are usually very sour and lacking in juice, with the result that these trees are not commonly grown, though they may sometimes be seen in gardens. and also in village shrubberies, where they are probably planted chiefly on account of their medicinal qualities.

The trees have dark, greenish bark, usually a crooked trunk, and rather thick, spreading branches which do not form a dense bushy crown. They sometimes attain a height of 25 feet or more, but in Bengal they probably seldom exceed 15 feet. The dark green, glossy leaves have pointed tips and are broadest near the rounded base ; they are larger than those of most other kinds of *Citrus* except *C. decumana*, the pumelo, but they differ from those of the latter species by having leaf-stalks with very narrow wings. The sweet-scented white flowers closely resemble the flowers of all other members of the genus, but they are smaller than those of *C. decumana* and *C. medica*, larger than those of *C. aurantifolia*, and have a much bigger calyx with longer segments than those of *C. chrysocarpa*. The four or five waxy-white petals, and the circle of numerous white stamens surrounding a stout, white style, do not differ greatly from those of other species. The spherical, orange or golden-yellow fruits scarcely need description. Those of this species may be known from those of *C. chrysocarpa* by their tight skins, which cannot be readily separated from the contents without a knife, and by their rounded shape with no depression at the apex.

In Mediterranean countries these trees are said to attain a great age and size. Some are reported to be as much as 700 years old, and to reach 50 feet in height with a trunk-girth of 12 feet. Yields of from 3000 to 5000 oranges from one tree annually are not rare. In India, however, these figures are probably never approached, even in the most favourable climates.

All the sweet oranges with tight skins are probably to be regarded as varieties of this species. Several of these are grown in India ; the best kinds being known as Jaffa, Malta, and Jamaica oranges. The so-called "blood oranges", which have reddish pulp, are sometimes grown with success in the north of

India, and the "navel" oranges, which contain a small fruit within the rind of the main fruit at the end opposite the stalk, causing a curious depression at the apex, are also found in India. Other varieties are oval in shape and some remain green when ripe, but the latter are of inferior quality. The sweet oranges imported into India from overseas belong to this species.

The medicinal qualities of the various kinds of oranges do not seem to have been differentiated, though it is probable that their characteristics vary from this point of view as in other respects. The fruits are used in India to treat fevers, to purify the blood, to cure catarrh, and to improve the appetite. The rind is considered to be a carminative and a remedy for dyspepsia, vomiting, intestinal worms, and skin diseases. The roasted pulp is applied to ulcers and a poultice made from the fruit is used to cure skin troubles. The water distilled from orange flowers is employed as an antispasmodic and sedative in cases of nervousness and hysteria. In Europe an oil extracted from the flowers is used as a stimulating liniment as well as in perfumery.

The wood is yellowish, hard and close-grained, and weighs about 49 lb. per cubic foot when seasoned. In Europe it is used for turning, engraving, and cabinet making. Walking-sticks are made from the shoots and branches.

The flowers mostly open in the hot season and the fruits usually ripen in the following cold season.

A number of closely allied forms of *Citrus* with sour or bitter pulp are found in India, of which the most important is *C. Aurantium*, the bitter, or Seville, orange. A brief description of these plants is given above under the account of the genus.

**Citrus aurantifolia** Swingle. *Syn.* C. acida *Roxb.* C. Lima *Lunan.* C. Bergamia *Voigt.* C. medica *Linn.* var. acida *Brandis.*

(Aurantifolia is Latin meaning "with leaves like an orange". Acida is Latin meaning "sour". Lima is a Spanish name derived from the Arabic word "limun", meaning "lemon". Medica is Latin meaning "Persian", which recalls the fact that these fruits first came to the notice of the West through Persia).

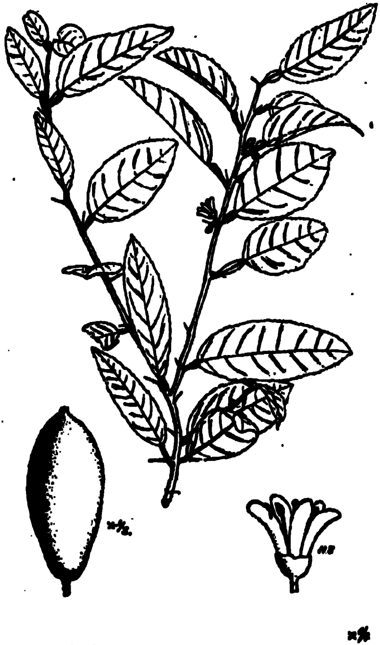
| | |
|---|---|
| Bengali; | *nimbu, limbu, nebu, lebu.* |
| Hindi, | *nimbu, limbu, nebu, lebu, limun.* |
| English, | *sour lime, Indian lime.* |

In Bengal the round-fruited variety is known as *patti nimbu* and the oval-fruited variety as *kaghzi nimbu* or *kaggi nimbu.* Outside Bengal the meaning of these names is usually reversed.

(F.I. p. 589. F.B.I. Vol. I. p. 515. B.P. Vol. I. p. 306.)

An evergreen, glabrous shrub or small tree, usually very spinous; leaves ovate, thin, crenulate-serrate, usually obtuse, narrowed or cuneate at the base, usually about 2 inches long; petiole about ⅓ inch long, narrowly winged; flowers bisexual or monoecious, about ½ inch diam., in small axillary clusters; calyx truncate or shallowly toothed; petals 4 or 5, waxy-white, very rarely tinged with pink, nearly 1 inch long; stamens 20 to 40; fruit variable in shape, usually mammillate, yellow or green when ripe, very smooth, usually not more than 2 inches long; rind thin, tightly attached; segments usually 10; pulp yellow-green, very acid, aromatic; vesicles very fine, shiny and elastic; seeds small, elliptic, smooth, often curved, creamy-white outside, white or greenish within.

The sour lime is usually a much branched thorny shrub, but it sometimes reaches the dimensions of a small tree. Its dark green, shining, evergreen leaves are oval in shape, with notched edges, and usually with a blunt point; they are set on short stalks which have two narrow wings. The small, sweet-scented flowers grow on short stalks in clusters among the leaves. The greenish calyx has four or five short teeth or lobes, (usually four), and there are the same number of waxy petals, which are usually pure white but are said to be occasionally pinkish on the outer surface. The stamens number from twenty to forty (more than are found in the flowers of most other *Citrus* species), and surround a stout style of about their own length. Some flowers are bisexual, but others are found with either the stamens or the style not fully developed. The fruits vary considerably in shape, but are always smaller than those of most cultivated *Citrus* fruits, and have smooth, tight-fitting skins, which remain green or become pale yellow when ripe. There is often a small rounded projection at the end of the fruit opposite stalk. The pulp is firm in texture, very acid, highly aromatic, and pale yellowish-green in colour. Near the centre of the fruit there is a concentration of small, plump, creamy-white seeds. The best fruits have very thin rinds, but those from plants grown from seed often have rather thick spongy skins.



*CITRUS AURANTIFOLIA*

This plant is commonly grown all over the plains of India and extends up to an altitude of 4000 feet in the hills. A number of varieties are grown, differing chiefly in the size, shape and colour of the fruits. Roxburgh mentions eight varieties and Firminger even more, but most of these are undoubtedly forms with larger fruits more akin to the oranges, and would be included by Tanaka in one of the other species mentioned above under the account of the genus. Some authorities state that a form of this plant, which is much used as a budding-stock for other kinds of *Citrus*, occurs wild in India, but this appears to need confirmation. The West Indian lime, from which most of the bottled lime-juice sold in Europe and elsewhere is made, appears to be a variety of this plant.

Limes are chiefly grown for their acid juice, which is used by all classes of people for making drinks and for flavouring curries, soup, and other foods. A pickle known as *"jarak nebu"* is made from the fruits by lightly scraping the rinds and then steeping the whole fruits in the juice of other limes, after which they are exposed in the sun for some days with the addition of salt, and then preserved in jars. This pickle is supposed to be a good remedy for indigestion.

Lime-juice is much used by Indian physicians, who consider it valuable to check biliousness and as an antiseptic. It is said to allay hysterical palpitations of the heart, and, if rubbed on the head, to soothe frenzied ravings. The irritation and swelling caused by mosquito bites are relieved by the application of this juice.

The flowers open principally in the hot season, and the ripe fruits are most plentiful in the cold season, but they are also produced at other times.

**Citrus medica** Linn.

(Medica is a Latin word meaning "Median", or "Persian". The citron first came to the notice of the western world through Persia).

| | |
|---|---|
| Bengali, | *beg pura, bijaura, bara nimbu, turanj, honsa nebu.* |
| Hindi, | *bijaura, kutla, bara nimbu, bijori.* |
| English, | *citron, Adam's apple, cedrat.* |

(F.I. p. 590. F.B.I. Vol. I. p. 514. B. P. Vol. I. p. 306.)

An evergreen glabrous shrub, or low spreading tree; branches flexuose, unarmed or with short, stiff spines; young shoots usually purplish; leaves lanceolate, or oblong, serrate, up to 7 inches long; petiole short, usually wingless, but sometimes with distinct wings; flowers bisexual or monoecious; calyx large and thick, lobes short; petals 4 or 5, sub-linear, white above, reddish or purplish below; stamens 20 to 40, or more, often purplish and pubescent, inserted round a distinct disk; style about equalling the stamens; ovary tapering into the style; fruits very variable in shape, usually mammillate; rind thick, often rough or irregular or warted, yellow when ripe; pulp pale yellow, usually scanty, mildly acid, or sweetish and insipid; seeds smooth, ovoid, white within.

A large number of very different varieties of *Citrus* are here grouped under the name of *Citrus medica*. The plants are sometimes straggling shrubs, but usually small, spreading trees with crooked branches, and short trunks covered with dark greyish bark. The evergreen leaves are broader than those of most oranges and limes, rather leathery in texture, and always notched at the edges; they are set on short stalks, which are usually wingless, but in some large-fruited varieties the leaf-stalks have quite broad wings resembling those of the pomelo. When crushed the leaves have the well-known scent of lemon, but to a much less pronounced extent than those of the real lemon plant. The rather large flowers are borne in clusters either at the ends of the twigs or in the axils of the leaves, with short lobes, from within which spring four or five narrow petals, which are white within but pinkish or purple on the outer side. The stamens number 20 to 40 or more, and are joined together in bundles as in the case of all other forms of *Citrus*; in this species they are often purplish in colour and covered with minute hairs. The ovary tapers into a stout style as long as the stamens. The fruits vary greatly in shape and flavour, but may be known by their large size, and more or less rough, soft, and irregular skins, usually with a pronounced blunt projection at the apex. The rind is thick, yellow when ripe outside, pure white within, and highly aromatic; but the pale yellow pulp is lacking in flavour and varies from a mild acidity to a mawkish, insipid sweetness.

The citron may almost always be distinguished, when not in fruit, from all other citrus plants, except the lemon and the "*khatta*" or "*karna*" orange, by its pinkish petals and its purplish young shoots. It may be known from the lemon by its leathery leaves, almost devoid of large visible dots marking the position of oil glands, and lacking a strong smell of lemon when rubbed. From the *khatta* orange it may be distinguished by its much large leaves, usually four inches or more in length, and generally by its wingless leaf-stalks.

Various varieties of the citron are cultivated in most parts of India, but nowhere on a large scale. Dr. Bonavia divides them into four principal groups as follows:—

1. The *chhangura*, which is considered to be the wild or primitive form of the plant, with small, very rough fruits, almost devoid of pulp. It is found wild in many parts of India, including the low hills of Behar, Assam, and north Bengal.

2. The *turunj*, with large fruits having thick skins, the white

part of which is sweet and edible. The pulp is scanty, dry, and acid. The leaves are usually oblong with a pronounced notch at the apex.

3. The *madhkunkur,* or *madhankri,* with large fruits having very thick sweetish skins, and scanty, sweetish pulp. The leaves are usually rather narrow and often pointed.

4. The *bajoura,* which has smaller fruits with fairly smooth, rather thin skins and abundant acid juice, not unlike those of a lemon, but larger.

Firminger mentions three varieties:—the common citron with fruits about as large as an ostrich's egg, much knobbed and warted ; a variety known in Europe as the *poncire,* with enormous fruits as much as a foot long ; and an extraordinary plant, known as the fingered citron, with fruits resembling a man's hand with its fingers bent up with cramp. The latter variety is said to be not uncommon in the north-west of India, and is also found in China and America ; it has been given the name of *C. medica var. sarcodactylis* Swingle. (Sarcodactylis is from the Greek "sarx", flesh, and "daktulos", a finger).

Citrons are not much used in India except for medicinal purposes, but the rind and pulp are made into marmalade and other preserves. The rind is candied to make it into a sweetmeat, and the juice, when sufficiently acid and plentiful, is used to make drinks. The fruit of the wild form of the plant is said to be pickled.

The rind is used medicinally as a remedy for dysentery, and the distilled juice of the fruit is said to be a sedative. The rind is sometimes eaten to counteract halitosis. Theophrastus and other ancient authors believed the fruit to be an expellent of poisons.

In China the fruits are employed to scent the air in houses, and are put among clothes to keep away moths. On distillation they yield a fragrant oil known as cedrat, which is used in perfumery.

The wood is white, fairly hard, fine-grained, and rather heavy. It is sometimes used for making agricultural implements, and the branches make good walking-sticks.

A remarkable way of growing the fruits of this plant is occasionally adopted. The branch bearing the young fruit is bent down until the fruit can be inserted in a large, narrow-necked vessel sunk in the ground. The fruit swells and fills the whole pot, growing to a size much above normal. The pot must, of course eventually be broken in order to extract the fruit. By using suitable pots, fruits of any shape can be produced in this way, and citrons shaped like human heads have been produced for sale as curiosities. The fruits so grown are said to be specially fragrant.

The citron is only sparingly cultivated in lower Bengal, and seldom fruits freely in such a damp climate. The flowers are borne mostly in the hot season and the fruits ripen chiefly in the cold season, but ripe fruits may be produced at all times of the year under suitable conditions.

Some varieties of citron approach very closely to lemons, and it is in fact very difficult, if not impossible, to draw a dividing line between citrons and lemons. The lemon is considered by many authorities to be a variety of the citron (*C. medica var. Limonum*), but it is here treated as a separate species, *C. Limon* Burm., and briefly described above under the account of the genus. It is usually a straggling shrub, and is not uncommon in Bengal gardens. The early authorities considered the limes also to be varieties of *C. medica*.

**Citrus grandis Osbeck.** *Syn.* C. decumana *Linn.*

(Grandis is Latin meaning "large". Decumana is Latin meaning "imposing").

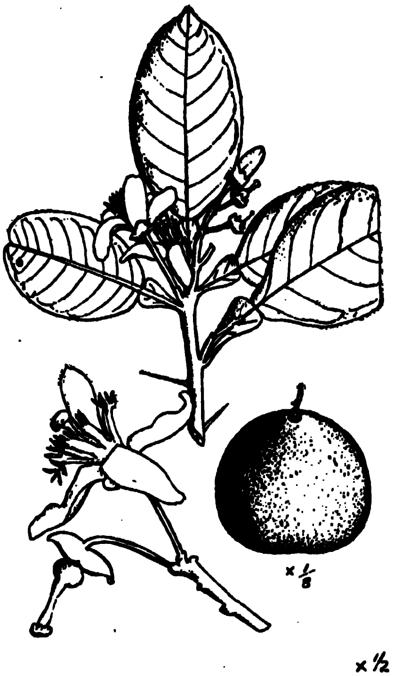
| | |
|---|---|
| Bengali, | *batavi nebu, mahanimbu, batornebu.* |
| Hindi, | *chakotra, mahanibu, sadaphal.* |
| English, | *pumelo, pompelmos, pompoleon, shaddock, paradise-apple, forbidden fruit.* |

The word pumelo is a contraction of "pomum melo", meaning "melon apple". The name shaddock is after Captain Shaddock who introduced the fruit from Malaya into the West Indies.

(F.I. p. 590. F.B.I. Vol. I. p. 516. B.P. Vol. p. 307.)

An evergreen tree ; young shoots pubescent ; leaves ovate or ovate-elliptic, often emarginate, usually crenate, base rounded, coriaceus, pubescent beneath when young, up to 6 inches long or more ; petiole broadly winged, up to 2 inches long, obovate or oblanceolate ; flowers pure white, axillary, 1 inch diam. or larger, scented ; stamens 15 to 25 ; style short ; stigma capitate ; fruit usually 6 to 8 inches diam., globose or broadly pyriform, yellow when ripe ; rind thick, spongy ; pulp pink or pale yellow, or sometimes crimson ; segments usually 10 to 14 ; vesicles large, loose ; juice sweet or acid ; seeds flattened, white within.

The pumelo is a round-headed evergreen tree, in suitable climates sometimes attaining forty feet in height, with regular branches and usually a short crooked trunk. Its bark is smooth and dark greyish-brown in colour, and its branches are sometimes armed with a few small spines. The leathery, dark green, glossy leaves have a broadly rounded base and are more or less pointed at the apex, though there is often a small notch at the tip. The margins of the leaves usually have rounded teeth, though plants with smooth-edged leaves are also found. The leaf-stalks are very broadly winged and give the impression of a second leaf at the base of the main leaf.. The pure white, sweet-scented, waxy flowers grow singly or in clusters at the bases of the leaves ; they closely resemble those of other *Citrus* plants, but are probably larger than those of any other species, and have not more than 25 stamens, which are joined into several distinct bundles. The fruits are the largest of the genus, and sometimes reach nearly a foot in diameter. They are pale yellow when ripe, usually spherical in shape, but sometimes slightly pear-shaped. The rind is fairly smooth in texture but prominently marked with greenish dots ; the yellow outer layer is thin, but inside it there is a thick layer of white spongy material, which can easily be detached from the segments that hold the pulp. The latter number from 10 to 15 and contain many large vesicles, which are loose and can easily be separated from one another without breaking their transparent skins and releasing the juice. The pulp varies in colour from deep crimson to pale greenish-yellow, and the flavour from extremely acid to sweet with a delicate and pleasant bitter tang. In each segment there are several large flattened seeds of a pale straw-colour outside, and whitish within.



CITRUS GRANDIS

The pumelo is one of the best fruits to be found in Bengal and is commonly cultivated all over the province. A number of varieties are grown, differing greatly in the flavour and colour of the pulp. Most kinds with yellow pulp are acid, and the best fruits usually have pale pink pulp, though not all pale pink varieties are of good quality. Those with deep red flesh are often coarse and lacking in juice, but Dr. Bonavia said that the best pumelos he had seen were "the thin-skinned red pumelos of Bombay". The fruits are chiefly valued for their pulp, which is eaten as dessert and made into salads ; but the outer rind can be made into excellent marmalade, and can also be used to make a drink like lemon squash. The insides of the seeds have a pleasant bitter taste and are sometimes eaten.

The leaves are said to be used medicinally in epilepsy, chorea, and convulsive cough. The juice is occasionally employed in the treatment of fevers, and a variety known as *"sui gal"* (because it is thought to be so acid as to dissolve needles), with intensely sour fruits, is occasionally grown specially for medicinal purposes. In Brazil a gum which exudes from the tree when it begins to decay, is used as a remedy for coughs. The seeds are used in dyspepsia and coughs and as a cure for lumbago.

The wood is cream-coloured, hard, very tough, fine-grained and heavy. It seems to be put to little use in India.

In Bengal the flowers are chiefly produced in February and March, and the fruits ripen from July to November ; but a few flowers may usually be found at all seasons, and in some other parts of India fruits ripen at all times of the year.

The pumelo is a native of the islands of Malaya, but is now cultivated in most tropical countries. It is very common in gardens and villages all over Bengal.

The well-known grape fruit is closely allied to the pumelo, as are several other forms of *Citrus* that are not uncommon in India. A brief description of these nearly related plants is given above under the account of the genus. The grapefruit grows fairly well in the neighbourhood of Calcutta.

**FERONIA.** (The ancient name of an old Italian goddess of the forest.) A genus containing one species only, distinguished by flowers with 10 to 12 stamens inserted round a small disc, leaves divided into separate leaflets set on either side of a central midrib (pinnate), and woody fruits containing 5 or 6 cavities (cells) with numerous seeds.

**Feronia Limonia** (L.) Swingle. *Syn.* F. Elephantum *Correa.* Crataeva Valanga *Koenig.*

(Limonia is an old generic name. Elephantum in Latin means "of the elephants").

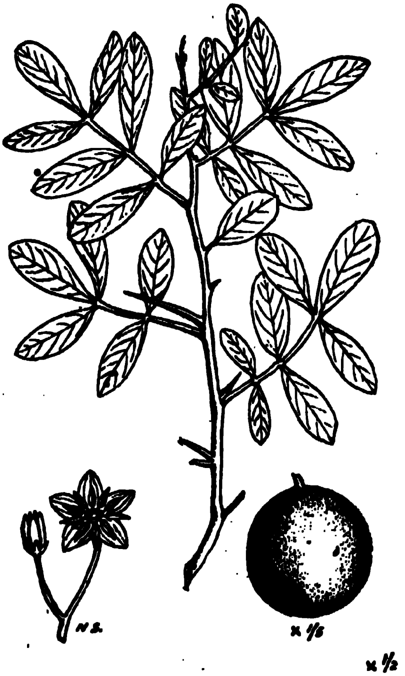
| | |
|---|---|
| Bengali, | *kath bel, kait, katbel.* |
| Hindi, | *kaith, bilin, katbel, kavitha, kobitha.* |
| Urdu, | *kaitha.* |
| English, | *elephant apple, wood apple, curd fruit, monkey fruit,* (The name *elephant apple* is also given to *Dillenia indica*). |

(F.I. p. 374. F.B.I. Vol. I. p. 516. B.P. Vol. I. p.305.)

A spinous, deciduous, glabrous tree ; leaves alternate, imparipinnate, leaflets 5 to 7, opposite, subsessile, entire, cuneate or obovate, about 1 inch

**long ; rachis sometimes narrowly winged ; flowers in loose panicles or racemes, ⅓ inch diameter, dull red or whitish, usually hermaphrodite ; sepals minute, petals imbricate, ⅓ inch long ; stamens 10 to 12, filaments short, subulate from a broad base ; fruit globose, grey, rough, 2 to 3 inches diam.; rind woody ; seeds numerous, oblong, embedded in fleshy pulp.**

This is a middle-sized tree with a straight trunk, dark grey bark, and branches which give the crown of the tree a more or less oval or rounded outline. The lower branches of young trees are armed with long spines, but otherwise the trees are often almost spineless. The leaves are divided into 5 or 7 small, dark green, rather narrow leaflets arranged in opposite pairs on either side of a midrib with a terminal leaflet at the tip. The midrib is often bordered by two very narrow wings, and there is sometimes a straight spine on the stem at the base of each leaf-stalk. Many small flowers grow in short clusters at the ends of, or along, the branches, each having five pale greenish or reddish petals and ten or twelve stamens with large, erect, chocolate-coloured anthers, which form the conspicuous part of the flower. The spherical fruits have a hard woody rind, which is rough in texture and grey in colour ; within there is a soft, brown, mealy substance, with a strong smell rather like that of rancid butter, but nevertheless edible, and much sought after by men and animals.



*FERONIA LIMONIA*

A number of authorities state that this plant is polygamous (i.e. having both bisexual and unisexual flowers), and that male, female, and hermaphrodite flowers may be found mingled in the same cluster. But observations in Bengal indicate that all the flowers are bisexual, though the ovary develops slowly before the anthers mature, so that at first sight the more mature flowers appear to be hermaphrodite and the less mature, owing to the comparatively minute size of their ovaries, to be male.

Owing to its small, widely scattered leaflets, the tree may be mistaken at a distance for *Pithecolobium dulce,* the Madras thorn.

The fruit has a very harsh taste, but is sometimes eaten raw with sugar, and is often made into a jelly, said to resemble black-currant jelly, but with a more astringent flavour. The fruits are also used, with the addition of salt, oil, and pepper, to make a kind of chutney, and a pleasant drink can be made from the pulp ; they need to be ripened in the sun for about a fortnight after gathering.

A gum obtained from the trunk is similar to gum arabic, and has been used for preparing artists' water colours, for which purpose it is said to be very suitable. It is also used for making dyes and varnishes.

Medicinally the fruit is used as a stimulant in diseases of children, and as an astringent in cases of dysentery ; it is also believed to be good for hiccough and sore throat. The pulp applied externally is a remedy for the bites and stings of venomous insects, and the powdered rind of the fruit is used for the same purpose. An oil obtained by crushing the leaves is used as a cure for itch, and the leaves are prescribed for treating the digestive troubles of children. Almost all parts of the tree are commonly thought to be a remedy for snake-bite.

The timber is hard, and weighs about 50 lb. per cubic foot. It is used for housebuilding, naves of wheels, and agricultural implements.

The hard dry shells of the fruits are made into snuff boxes and similar objects.

The tree is indigenous in South India and Ceylon, and is common all over the plains of India, especially in the dryer regions. Near Calcutta it is not very common but is occasionally planted in gardens and near villages. A specimen may be seen in the Durgapur Basti, north of the bridge over the canal and railway, and another grows in the Royal Agri.-Horti. Garden in Alipore.

The flowers appear soon after the new leaves in February and March, and the fruits ripen in September or October. The branches are bare of leaves for a short time at the end of the cold season.

The tree is very slow-growing. It is occasionally used by gardens as a stock for grafting other plants of the *Citrus* family.

**AEGLE.** (From the ancient Greek name of one of the Naiads, or water nymphs). A genus of 2 or 3 species of thorny trees, natives of tropical Asia and Africa, distinguished by leaves divided into 3 leaflets, bisexual white flowers with numerous stamens, and large spherical fruit containing 8 to 15 cavities (cells), and many seeds.

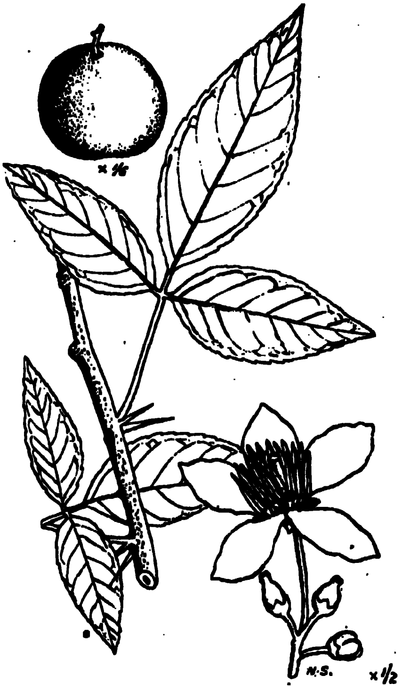
**Aegle Marmelos** Correa. *Syn.* Crataeva Marmelos *Linn.*

(Marmelos is the Portuguese name of this tree).

| | |
|---|---|
| Bengali, | *bel, bela, vilva.* |
| Hindi, | *bel, bili, sirphal, siriphal.* |
| Urdu, | *bel.* |
| English, | *bael, bael fruit tree, Bengal quince, golden apple, holy fruit, Indian quince, stone apple.* |

(F.I. p. 428. F.B.I. Vol. I. p. 516. B.P. Vol. I. p. 305.)

A middle-sized, deciduous, glabrous tree, usually with many straight axillary spines; leaves alternate, trifoliate (occasionally 5-foliolate); leaflets ovate-lanceolate, entire or crenate, up to 1½ inches long; flowers in short lateral panicles, scented, greenish white, 1¼ inches across; petals 4 or 5, imbricate; stamens 30 to 60, filaments short; fruit 3 to 8 inches diam., usually globose, smooth, grey, yellow, or greenish, rind woody; pulp sweet, aromatic, orange.



*AEGLE MARMELOS*

The bael is a small or middle-sized tree of rather straggling growth with thick, soft, grey bark. The leaves are divided into three (or very rarely five) small, rather narrow leaflets, and the branches are usually armed with numerous long straight spines. The rather large, greenish-white flowers, borne in short, open clusters along the branches, have a sweet, honey-like scent. The fruits are smooth and usually greyish-green in colour, but often yellowish when ripe. They vary greatly in size, and those of some cultivated trees occasionally grow as large as a man's head, though these do not seem to be considered as good as those of a more moderate size. A more ordinary width is about six inches, but the fruits of wild trees often do not exceed three inches in diameter. The usual shape is spherical, but elongated fruits are said to occur. The rind consists of a thin woody shell, which is very hard and tough, requiring considerable force to break it ; inside there is a soft, yellow or orange-coloured, limpid, shiny substance with a very fragrant scent and a pleasant flavour.

The pulp of the ripe fruit is much used, mixed with milk and sugar, to make a sherbet, and the fruit is also dried as a conserve. Many people are induced by the high medicinal reputation of the fruit to try the sherbet, and some soon acquire a taste for it. But the chief value of the fruit lies in its curative qualities, which make the tree one of the most important of Indian medicinal plants. The pulp of the ripe fruit is astringent, laxative, and tonic, and the sherbet is an excellent remedy for dysentery and similar troubles. The unripe fruit is also astringent, and is used in several ways as a cure for dysentery ; a sherbet made by baking the fruit and then straining the pulp is perhaps the most usual method, but the dried unripe fruit is also much used and is sold in the bazars. Other parts of the tree also have medicinal uses, particularly the leaves, from which a poultice is made as a cure for ophthalmia. The bark is prescribed for intermittent fevers, the juice of the leaves for catarrh and fever, and the root for palpitation of the heart.

The gummy substance found round the seeds is mixed with lime plaster, for use under water, or if a polished surface is required ; it is also considered an excellent addition to mortar, especially for building walls. The hard husk of the fruit is sometimes made into snuff-boxes and similar articles, and a dye is obtained from it.

The wood is hard with a strong aromatic scent when freshly cut ; it is useful for house-building, cart-making and similar purposes, but the trees are seldom cut owing to the value of their fruit. The wood weighs about 55 lb. per cubic feet.

To the Hindus this is the most sacred of all trees, its leaves being essential to the worship of the God Shiva. The three leaflets are symbolical of, first, the three *gunas* or attributes, namely *sattva, rajas,* and *tamas* ; secondly the three-eyed deity Shiva himself ; thirdly the three *avasthas* or states, namely *jagrat, sushupti,* and *swapna* (waking, sleeping, and dreaming) ; and fourthly the three lives, namely the past, the present, and the future. A leaf of the bael placed on the head of Shiva, or on his emblem the *lingam,* is considered to be conducive of happiness and the destruction of sins. There is a legend of a hunter who, while lying in wait for his quarry on a branch of a bael tree on a *Sivaratri* night, unconsciously plucked leaf after leaf from the tree and allowed them to fall onto a *lingam* that happened to be concealed beneath him, and thereby was absolved of all his sins and attained eternal bliss. A bael is planted in every temple garden.

The bael has been confused by some Indian writers, as well as by the great Linnaeus, "the Father of Botany", with *Crataeva Roxburghii* R. Br. (Bengali, *tikta sak*), a tree which resembles it in little except the unusual division of the leaf into 3 leaflets. In some parts of the country the two trees bear the same vernacular names, and the confusion still appears to persist.

The tree is indigenous in most of the dryer parts of India, and ascends the hills up to an altitude of 4000 feet in the Western Himalayas. It is not truly wild near Calcutta, but is very common in the neighbourhood of villages, and is often found growing as if wild in thickets and shrubberies.

The flowers mostly open in April and May soon after the new leaves. The fruit takes about a year to ripen, and ripe fruit may be obtained in Bengal from December to July.

## SIMARUBACEAE

A small family of about 28 genera comprising about 125 species of shrubs and trees with bitter bark, natives of hot countries, of which about 10 species are found in India. The leaves are usually divided into separate leaflets. The sepals and petals each number 3 to 5, and are equal so that the small flowers are symmetrical on all sides. The stamens are usually as many as the petals, or double the number, and are inserted outside a cup-shaped disc. The fruit consists of 1 to 5 more or less distinct divisions (carpels), each of which usually contains a single seed.

The family takes its name from the genus *Simaruba*, which is not represented in India.

**AILANTHUS.** (From a vernacular name of the Moluccas meaning "tree of heaven"). A genus of 7 species of large trees, natives of East Asia and Australia. The leaves are divided into two rows of separate leaflets set on either side of the midrib (pinnate), and are clustered near the ends of the branches. The small flowers grow in large clusters, hermaphrodite, male and female flowers being found mixed on the same tree (polygamous). The petals number 5, and the stamens 10 in the male flowers, but only 2 or 3 in the bisexual flowers. The fruit consists of 1 to 5 flat, papery divisions (carpels), each containing a single seed.

**Ailanthus excelsa** Roxb.

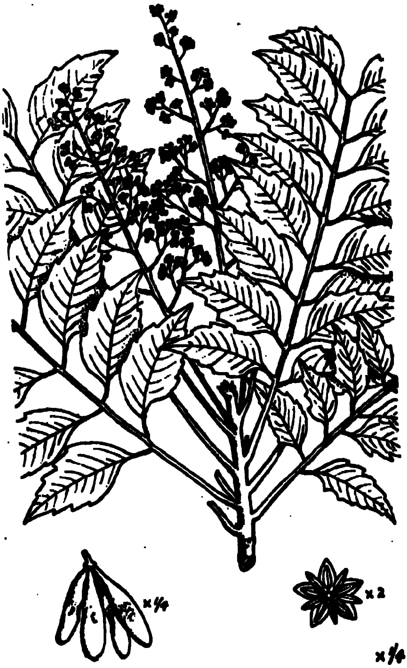
(Excelsa is Latin meaning "lofty".)

| | |
|---|---|
| Hindi, | *maharukh, mahanim, limbado, ajau.* |

(F.I. p. 386. F.B.I. Vol. I. p. 518. B.P. Vol. I. p. 308.)

A large, deciduous tree; leaves pinnate, tomentose, up to 3 feet long; leaflets 16 to 28, alternate or subopposite, coarsely and irregularly toothed or sublobate, very oblique, 4 to 6 inches long; flowers polygamous, very small, white or yellowish, in large lax panicles shorter than the leaves; petals ovate-lanceolate, glabrous, reflexed; filaments glabrous, about half as long as the anthers; ripe samaras about 2 inches by ½ inch, once or twice twisted at the base, coppery-red.

This is a tall quick-growing tree with rather rough, light-greyish-brown bark, and large branches, which start at right angles from the trunk but tend to curve upwards. The long leaves are clustered near the ends of the branches, from which they spread outwards stiffly in all directions. Each leaf is divided into a number of rather large, hairy, narrow leaflets, which are set in not quite opposite pairs on either side of the midrib, sometimes with a small terminal leaflet at the tip. The leaflets are very unequal-sided at the base, and are coarsely and irregularly toothed, or even lobed, along their edges. The very small; white or yellowish flowers grow in large open clusters among the leaves, male, female and bisexual flowers being intermingled on the same tree. The fruit consists of one or more flat, papery pods (known as "samaras" in botanical language), each of which contains a single seed clearly apparent from the outside. The samaras are reddish-brown in colour, and each is twisted once or twice near its base. They are very light and can be carried to a great distance by the wind, thus ensuring the wide dispersal of the seed.



*AILANTHUS EXCELSA*

The wood is white, soft and very light, weighing about 25 lb. per cubic foot, but is fairly strong. It is used for purposes where lightness is important, and especially for making the catamarans, or small raft-like boats, which are used for negotiating the surf on the east coast of India.

The bark is much used as a febrifuge, as a tonic, and to cure dysentery, ear-ache, asthma, and various other diseases. It is also valued as a medicine for cattle. The juice of the leaves is given as a tonic.

The tree is a native of Queensland, and has probably been introduced into India, where it is now common in most of the hotter parts, except near the sea. It is often grown as an avenue tree. In lower Bengal it does not occur spontaneously, but it is occasionally planted in the vicinity of Calcutta.

The leaves fall in the cold season and are replaced in March and April. The flowers appear at the end of the cold season, and the seeds ripen in May or June. The plant is easily propagated by seed or cuttings. The leaves have a very unpleasant smell when crushed.

## OCHNACEAE

A small family of trees and shrubs containing about 17 genera with 210 species, natives of the tropics and particularly the tropics of America. The leaves are not arranged in opposite pairs, and are usually not divided into separate leaflets. The flowers are hermaphrodite and conspicuous, usually with 5 sepals, 5 or more petals, and 10 or more stamens. The ovary is divided into from 3 to 10 cells, and the fruit usually consists of a cluster of from 3 to 10 berries, each containing from 1 to 4 seeds; but sometimes the fruit is a single capsule.

**OCHNA.** (From the Greek "ochne", a wild pear, which some of this genus were thought to resemble in foliage). This genus contains about 30 species of trees and shrubs, natives of tropical Asia and Africa. The margins of the leaves are usually saw-like. The flowers are large, having coloured sepals, yellow petals, and numerous stamens with anthers opening by terminal pores.

In addition to the species described below, one or two other shrubs of this genus are sometimes grown in Indian gardens.

**Ochna squarrosa** Linn.

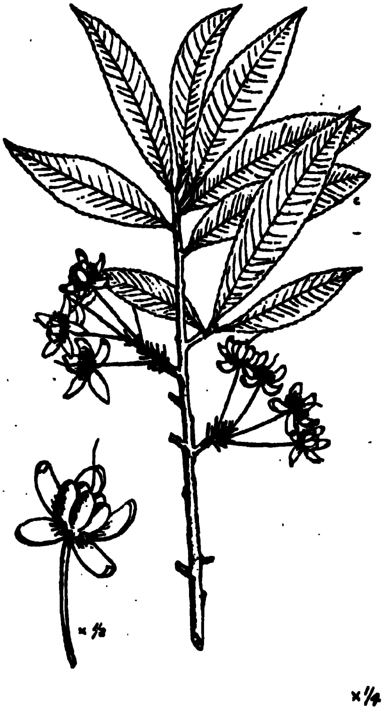
(Squarrosa in Latin means "rough" or "scurfy").

English, *golden champak.*

(F.I. p. 449. F.B.I. Vol. I. p. 524. B.P. Vol. I. p. 309.)

Leaves elliptic or elliptic-lanceolate, acute, finely serrulate, 3 to 5 inches long, narrowed into a short petiole; flowers fragrant; panicles loose, about 2 to 3 inches long; corolla about 1 inch diam., petals 5 to 12, yellow; stamens numerous, anthers much larger than the short filaments; styles combined; pedicels 1 to 1½ inches long; drupes 3 to 10, ½ inch long, seated on the greatly enlarged disc, surrounded by the persistent coriaceous sepals, 1-seeded.

This is a handsome shrub or a small tree with smooth, brown bark and rather narrow, pointed leaves, set on short stalks, with finely notched margins. The leaves fall in the cold weather, and are replaced in February and March, the new foliage being more or less red in colour. While the young leaves are still red, or even before they open, the bright yellow flowers appear in small open clusters along the branches. Their petals vary in number from 5 to 12, while the stamens are very numerous and carry large anthers, from which the pollen escapes by small holes at their tips. The flowers are delicately scented, and their clear yellow makes a beautiful contrast with the dark branches and reddish leaves. The fruit consists of a cluster of shining black berries borne on a scarlet boss and surrounded by the deep purple sepals.



*OCHNA SQUARROSA*

The root of this plant is long, tuberous, and twisted, and, being reminiscent of a snake, is used by the Santals as an antidote to snake-bite. It is also used for other medicinal purposes. The bark is held to be a digestive tonic, and the leaves are used to make a soothing dressing for wounds.

The wood is fairly hard and close-grained, but warps badly. It is made into walking-sticks. The weight is about 50 lb. per cubic foot.

The plant is a native of peninsular India, Assam, Burma, and Ceylon. It is commonly planted in Indian gardens and is not uncommon in Calcutta. It often flowers when quite a small shrub.

# BURSERACEAE

A small family of resinous trees and shrubs, comprising about 13 genera with 300 species, all natives of the tropics. The leaves are usually not arranged in opposite pairs, and are divided into separate leaflets set on either side of a central midrib with a terminal leaflet at the tip (imparipinnate). The flowers are small and may be hermaphrodite or unisexual. The petals number from 3 to 5, and the stamens are of the same number as the petals, or twice as many, inserted near the edge of a disc. The fruit is usually a berry with one or more stones, each containing one seed.

The family takes its name from the genus *Bursera*, which includes about 40 species of trees, mostly of tropical America; one species is found in India.

**GARUGA.** (A native Malayan name). This genus contains about 10 species of trees, natives of tropical America, Asia and Australia, of which only one is found in India. The fruit consists of a fleshy berry containing from 1 to 5 seeds. The petals number 5 and the stamens 10, the flowers being hermaphrodite or unisexual, and male, female, and bisexual flowers occurring on the same tree. The calyx is bell-shaped, and divided into 5 segments.

**Garuga pinnata** Roxb.

(Pinnata in Latin means "feathered", alluding to the leaves).

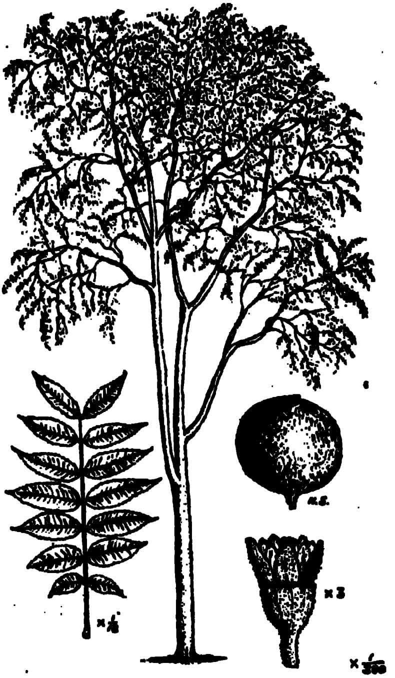
| | |
|---|---|
| Bengali, | *jum, tum, kharpat, nil bhadi, dabdabe.* |
| Hindi, | *ghogar, kaikar, tum, kharpat.* |

(F.I. p. 370. F.B.I. Vol. I. p. 528. B.P. Vol. I. p. 311.)

A deciduous tree; leaves imparipinnate, 1 foot long or more; leaflets 13 to 19, opposite, lanceolate or ovate-lanceolate, crenate, up to 6 inches long; panicles clustered at ends of branches; flowers polygamous; calyx campanulate, 5-fid, valvate, lined by the disc; petals 5, linear; stamens 10, filaments hairy at the base; ovary ovoid, narrowing into the hairy style; drupe black, globose, fleshy, about ¼ inch long; seed with a membranous wing.

This is a fairly tall tree with thick, soft bark, grey or brown outside and red within, which peels off in irregular flakes. The leaves grow closely crowded at the ends of the branches, and are divided into separate leaflets arranged in opposite pairs in two rows on either side of a midrib with a terminal leaflet at the tip. The leaflets are variable in size, but are always rather narrow and pointed with strongly toothed or notched margins. In the cold season the leaves fall and, when the trees are bare in March and April, the small, yellow, bell-shaped flowers appear in numerous open clusters at the ends of the branches, to be closely followed by the fresh young leaves. Both hermaphrodite and unisexual flowers are found, and both occur on the same tree.. The fruits resemble small black grapes or gooseberries, and are sometimes borne in great profusion, becoming very conspicuous when the leaves fall.

During the rains the leaves of this tree, or some of them, often turn orange or brilliant crimson in colour. This is due to the attacks of minute insects.



*GARUGA PINNATA*

The fruits are eaten raw, cooked, and pickled, but they are very acid and are generally regarded as a semi-medicinal article of diet, for they are considered to have digestive qualities. The juice of the stem is used to cure eye-troubles, and the juice of the leaves, mixed with honey, is a remedy for asthma. The root is used to cure affections of the lungs.

The timber is variable, and does not make a good fuel, but the heartwood from old trees is a handsome reddish brown timber of fair quality. The weight averages about 40 lb. per cubic foot. It is said to season well, but to be very liable to attack by insects. It is made into planks, canoes, drums, and furniture.

The bark is used for tanning in many parts of India, as also are the galls from the leaves. The leaves and shoots are collected as fodder, especially for elephants.

The tree is common in forests throughout India up to 3000 feet elevation. It is not indigenous near Calcutta, but is occasionally planted in the neighbourhood, and a specimen may be seen (in 1944) on the Maidan near Hastings to the west of St. George's Gate Road.

# MELIACEAE

This is a family of about 40 genera with 600 species of trees and shrubs, mostly natives of tropical countries. The leaves are alternately arranged, and are generally divided into separate leaflets set in 2 rows on either side of a central midrib (pinnate). The flowers are usually bisexual, and grow in branching clusters (panicles). The calyx is small and cleft into 4 or 5 segments; the petals are separate; and the stamens, which are usually double the number of the petals, are generally united into a tube. A disc between the stamens and the ovary sometimes forms a sheath enclosing the ovary, which has only 1 style. The fruit is a capsule or a berry.

This family is of considerable importance in India, containing a number of valuable timber trees.

**AZADIRACHTA.** (A Persian name). A genus containing one species only, a native of India and Malaya, which was formerly included in the genus *Melia*, from which it may be distinguished by toothed leaflets, and the leaves divided once only into two rows of leaflets (pinnate). Both genera have stamens united into a tube, berry-like fruits, seeds without wings, and spreading petals.

**Azadirachta indica** A. Juss. *Syn.* Melia Azadirachta *Linn.*

(Indica in Latin means "of India").

| | |
|---|---|
| Bengali, | *nim, nimgachh.* |
| Hindi, | *nim, balnimb, nimb, nind.* |
| Urdu, | *nim.* |
| English, | *neem tree, margosa tree, Indian lilac.* |

(F.I. p. 368. F.B.I. Vol. I. p. 544. B.P. Vol. I. p. 314.)

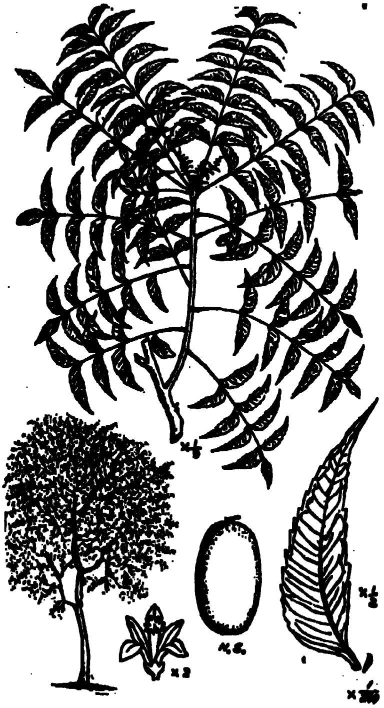
A large, glabrous, evergreen tree; leaves imparipinnate, 8 to 15 inches long, crowded near ends of branches; leaflets 14 to 19, opposite or alternate, obliquely falcate-lanceolate, serrate, the odd one sometimes wanting; flowers in short axillary panicles, white, scented, 1/5 inch long, pentamerous; staminal tube 10-dentate, anthers inserted inside; drupe ½ to ¾ inch long, oblong, yellow when ripe.

This is a tall, graceful, evergreen tree with rather rough greyish or brownish bark, and delicate foliage. The leaves are divided into two rows of shining bright green leaflets set on either side of a central midrib, usually with a terminal leaflet at the tip. Each leaflet is long, narrow, and pointed, slightly curved and unequal-sided, and has saw-edged margins. Many small, white, honey-scented flowers grow in short, loose clusters from near the bases of the leaves, by which they are usually partially concealed. The fruit is a small smooth berry which turns yellow when ripe, and contains one seed set in soft juicy pulp.

The young leaves appear at intervals throughout the year, but chiefly about the beginning of March, at which time the branches are sometimes almost bare of foliage. They are often tinged with red. The flowers open principally during March and April, but often another flush of bloom occurs during the rains. Their sweet scent is a great attraction to insects, and the bunches of yellow fruits are much eaten by birds. The fruits mostly ripen at the beginning of the rains.

The neem is one of the best known and important of Indian trees, not only because of the reverence in which it is held by the Hindus, but because of its valuable medicinal properties, which have always been fully appreciated in India, and are now being utilised on a commercial scale in the manufacture of soaps, tooth-pastes, and many other preparations. Almost every part of the tree is largely employed medicinally and it is not easy to give a brief summary of its many uses.

Perhaps the most important product of the neem is the deep-yellow, acrid oil that is extracted from the seeds and is known commercially as margosa oil. This oil is employed by poor people for burning, but it gives off too much smoke to be really suitable for this purpose, and it is used principally for its antiseptic and anthelmintic qualities and as an application in rheumatism. A bright amber-coloured gum is obtained from the bark which is valued as a stimulant and tonic. The bark of the roots and stems and the young fruits also have tonic properties, and are used to cure intermittent fever. An antiseptic lotion is made from the leaves, which are also widely employed to keep insects away from clothes and books, and to make poultices for ulcers and similar troubles. The flowers are given as a tonic.



*AZADIRACHTA INDICA*

In spring incisions are sometimes made at the base of the trunk from which a quantity of sap issues, and often flows for weeks. This is used as a stomachic and cooling drink.

The leaves are cooked and eaten with other vegetables in the form of a curry, or are simply dried and eaten raw ; they have a strong bitter taste but no smell. The sweet pulp of the fruit is also occasionally eaten, especially in times of scarcity. The twigs are very commonly employed as tooth-cleaners. The leaves are collected as fodder for cattle, and the leaves and twigs to rot down as manure.

The timber is hard and close-grained, the weight being about 50 lb. per cubic foot. It is durable, and is much used for carts, ship-building, agricultural implements, toys, and furniture.

By the Hindus the neem is held sacred, chiefly owing to the antiseptic and prophylactic properties inherent in the tree. Idols are made out of its wood, and there is a general reluctance to cut down or destroy one of these trees. Yogis and other people of a religious temperament sometimes eat the bitter leaves and fruits in order to make themselves immune to the allurements of beauty, and it is said that such people can in this way become immune to poisons.

Many Indians believe the neem to have great virtue in keeping fevers and sickness away. A bunch of neem leaves is often tied to the door of a house when small-pox is prevalent, and also on the occasion of a birth or a death to keep away evil spirits. Travellers prefer to sleep under a neem tree in the belief that it will keep off fevers, and the beds of small-pox patients are entwined with wreaths of neem and jasmine. Fresh neem leaves are given to those who have been bitten by snakes in the belief that if the leaves taste bitter, they will recover, but if sweet, they will die ; as the leaves are normally intensely bitter, the result of this test must often prove encouraging.

This tree is a native of Burma but is now common all over India, and in many other hot countries. It is specially suited for dry climates, but is abundant in lower Bengal, where it is much planted near houses, and as an avenue tree for which it is extremely suitable. It is common in and about Calcutta.

**MELIA.** (Ancient Greek name for the ash tree, *Fraxinus excelsior* Linn., the leaf of which closely resembles the leaf of the neem, *Azadirachta indica*, which used to be included in this genus under the name of *Melia Azadirachta*.) A genus of about 12 species of trees, natives of eastern tropical Asia, of which 3 are found in India. The leaves are divided into separate leaflets branching from a midrib, the lower branches of the midrib being divided once or twice more before the leaflets are reached (bipinnate or tripinnate). The stamens are united into a tube, and the fruit consists of a berry with a single stone containing 1 or more seeds.

**Melia Azedarach** Linn.

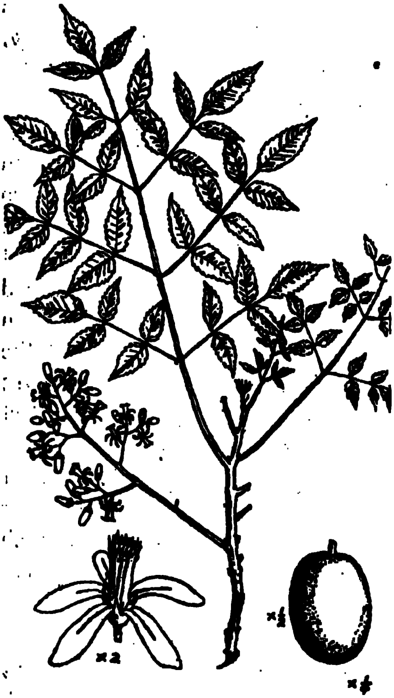
(Azedarach is the Persian name of this tree).

| | |
|---|---|
| Bengali, | *bakarjan, gora nim, mahanim.* |
| Hindi, | *bakain, drek, betain, deikna, bakarja, mahaninb,* |
| Urdu, | *bakayana.* |
| English, | *Persian lilac, bead tree, Barbados lilac, Indian lilac, pride of China, pride of India, China tree.* |

(F.I. p. 369. F.B.I. Vol. I. p. 544. B.P. Vol. I. p. 313.)

A middle-sized deciduous tree; leaves pinnate near apex with a terminal leaflet, bipinnate or tripinnate nearer base, up to 20 inches long; leaflets opposite, ovate-lanceolate, up to 3 inches long, sometimes serrate; flowers bisexual, panicled, ½ to ⅓ inch long, scented, lilac, or purple and white; drupe shining, subglobose, ½ to ¾ inch diam.; endocarp hard, often 5-6-celled.

This is a handsome tree, usually of moderate size, with greyish-brown bark marked with long, shallow, vertical fissures. Its leaves are divided into separate, pointed leaflets, which near the tip of the leaf spring directly from the midrib of the leaf, but nearer the base are borne on lateral branches of the midrib, which are usually arranged in three or four opposite pairs.



*MELIA AZEDARACH.*

The small, lilac-coloured flowers grow in branching clusters, which are placed near the bases of the leaf-stalks, and, as the clusters are shorter than the leaves, are often partly hidden by the foliage. The fruits consist of almost spherical shining berries, which at first are bright green in colour, but ripen to yellow in the cold weather, when the falling leaves reveal them clearly.

Usually the first flowers appear on the bare branches in February and March, but the new leaves open almost at the same time, so that the tree is soon covered with a mixture of lilac-coloured honey-scented blossom, and bright green, delicately divided, leaves. Occasionally a tree flowers in December, and some trees regularly produce new leaves in October and November. When in blooms this is one of the most beautiful of trees, and by night the surrounding air is permeated by the scent of its flowers. Each flower consists of five or six white or pale lilac petals surrounding the deep purple tube formed by the stamens.

The fruit is poisonous to man, but is said to be greedily eaten by sheep and goats. The stones from the fruit are used all over India as beads, being easily perforated and made into necklaces and rosaries, when they are supposed to act as charms against disease. In America the leaves and fruits are collected to keep away insects.

The tree is very quick-growing, and the timber, though soft, is prettily marked, and is useful for furniture-making and similar purposes. Its weight is about 35 lb. per cubic foot.

Various parts of the tree have long been used for medicinal purposes by the Arabs and Persians. The seeds are believed to relieve rheumatism, and the leaves to cure nervous headaches and hysteria. The fruits, as well as the leaves, are a remedy for skin troubles and the bark is said to be an effective tonic.

There are several forms of this tree, one of which flowers as a seedling, and never exceeds about 6 feet in height ; another form has a dense umbrella-shaped crown ; and the third and commonest variety has a rather straggling habit of growth. These forms come true to seed. A distinct variety with spreading branches and drooping foliage is known in the U.S.A. as the "Texas umbrella tree".

The species is believed to be indigenous in Baluchistan, but is now naturalised all over India and in many hot countries. It is common in Calcutta gardens. A fine specimen with an umbrella-shaped crown grows on the east side of the Victoria Memorial gardens.

**APPANAMIXIS.** This genus includes about 25 species of evergreen trees, natives of India, Malaya, and Australia, of which about 6 species are found in India. The leaves are divided into separate leaflets arranged on opposite sides of a midrib, with a terminal leaflet at the tip (imparipinnate). The flowers are usually unisexual, and the two sexes are generally found on different trees (dioecious). There are only 3 petals, and the stamens are combined into an almost spherical tube. The fruit is a pod containing 1 to 3 seeds, each enclosed in a fleshy covering.

**Appanamixis polystachya** (Wall.) R. N. Parker. *Syn.* Amoora polystachya *Hk.* A. Rohutika *W. & A.* Andersonia Rohutika *Roxb.*

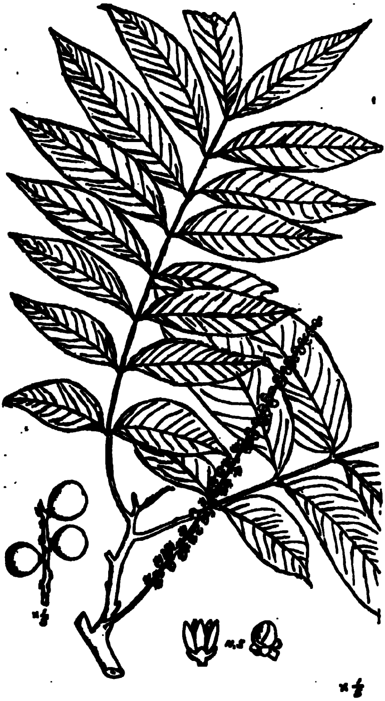
(Rohituka is the Sanskrit name of this tree. Polystachya in Greek means "with many spikes").

| | |
|---|---|
| Bengali, | *tikta raj, pitraj.* |
| Hindi, | *harin harra, harin khana.* |

(F.I. p. 311. F.B.I. Vol. I. p. 559. B.P. Vol. I. p. 316.)

Leaves imparipinnate, 1 to 3 feet long; leaflets 9 to 15, entire, elliptic or ovate, acuminate, glabrous, 3 to 9 inches long; flowers usually dioecious; male flowers ⅛ inch long, sessile in terminal panicles; female ¼ inch long, sessile in solitary spikes much shorter than the leaves; calyx 5-partite; petals 3; anthers 6, attached to the staminal tube at its base; capsule globose, yellow when ripe, 3-valved, 1 to 1½ inches diam.; seeds oblong, orange or scarlet.

This plant is usually a middle-sized evergreen tree with a heavy rounded crown, but it sometimes grows in thickets and jungles as a straggling shrub. Its bark is smooth, thin, and dark grey. The leaves are divided into a number of separate, bright green, pointed leaflets arranged in opposite pairs on either side of a midrib, with a terminal leaflet at the tip, which is usually smaller than the others. The pairs of leaflets are rather widely spaced along the midrib, and the lateral leaflets are generally very unequal-sided. The small white flowers have only three petals and are unisexual, the two sexes being found on separate trees. The female flowers grow on unbranched spikes, which are found plentifully distributed among the leaves. The male flowers are smaller, and are borne in branched clusters at the ends of the twigs. The fruit consists of a yellow sphere, which opens by three valves to disclose several large orange or scarlet seeds.



*APPANAMIXIS POLYSTACHYA*

The timber is hard, and even-grained, weighing about 40 lb. per cubic foot. It is of good quality but apparently little used, though canoes are said to be made from it.

The bark is strongly astringent, and is said to be a useful remedy for enlarged spleen. The seeds yield an oil which is used as a stimulating liniment in rheumatism, as a cure for diseases of the blood, and as a dressing for sores.

The flowers appear from September to November, and the seeds ripen at the end of the cold weather, sometimes remaining in the husks of the fruit till April.

The tree is a native of most of the hotter parts of India, Malaya and Ceylon. It is common in thickets and village shrubberies near Calcutta, and is sometimes grown in gardens for its fine evergreen foliage ; but it is probably not indigenous in lower Bengal.

**SWIETENIA.** (After Gerard van Swieten, a Dutch botanist, 1700-72). A genus containing 3 species of trees, natives of tropical America, of which 2 species are now commonly grown in India. The genus is distinguished by its large fruit containing numerous seeds, which are winged at one end only. The stamens are joined into an urn-shaped tube with 10 teeth, which springs from a pink or orange disc. The flowers are bisexual.

**Swietenia Mahagoni** Linn.

(Mahagoni is a West Indian vernacular name).

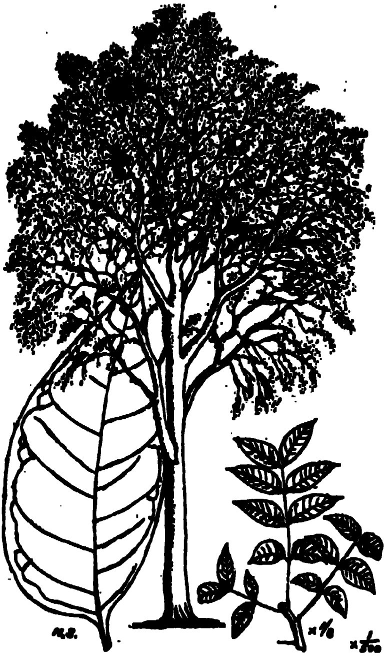
| | |
|---|---|
| Bengali, | *mahagni.* |
| English, | *mahogany, Spanish mahogany.* |

(F.B.I. Vol. I. p. 540. B.P. Vol. I. p. 319.)

A tall tree ; leaves paripinnate, glabrous ; leaflets 4 to 10, opposite, obliquely ovate or lanceolate, long-acuminate, of mature tree about 1½ inches long, by ½ inch broad, of young tree longer and much broader ; petiolule ¼ inch long ; flowers in axillary panicles, greenish yellow, ¼ inch across ; petals 5, spreading ; disc annular, cerise ; capsule 5-celled, about 3 inches diam., subglobose ; seeds many, winged.

The real Spanish mahogany is a magnificent evergreen tree, tall and spreading, with rough grey-brown bark which flakes off in small pieces, and a stout trunk. Its leaves are delicately divided into narrow, curved leaflets with tapering points, arranged in opposite pairs on a central midrib. The leaflets are of a dark shining green when mature, but when young have a peculiarly delicate shade of brilliant emerald ; those of mature trees often do not exceed two inches in length, but younger trees have longer and much broader leaflets, which under certain conditions sometimes are quite unlike the foliage of the mature tree, so that young trees of this species may occasionally be difficult to distinguish from those of the bastard mahogany, *Swietenia macrophylla* (see below). The small, greenish-yellow flowers grow in short open clusters in the axils of the leaves. Each flower has five spreading petals, within which the stamens form a tube with ten minute teeth, almost concealing a small disc of a brilliant cerise colour from which the tube springs. The fruit is a hard, almost spherical, woody capsule containing many seeds, each of which is winged at the upper end.

This tree yields perhaps the most famous timber in the world, and is largely used for furniture and for all purposes for which a hard wood of the best quality is needed. It is much employed in ship-building, for which it is very suitable, for it is extremely strong and durable. A Spanish man-of-war built of mahogany, when captured by the British 100 years later, was found to be sound in every timber. The weight of the wood is usually about 42 lb. per cubic foot.



*SWIETENIA MAHAGONI*

The mahogany is a native of Jamaica and Central America, whence it was first introduced into India at the end of the 18th century, when plants from the West Indies were grown in the Royal Botanic Gardens at Calcutta. Since then they have been planted in many parts of the country, with varying success, but the tree never seems to have been successfully grown in India for its timber, the quality of the wood in this country apparently being variable and on the whole inferior to the real "Spanish Mahogany" grown in the West Indies, though not much inferior to the so-called "Honduras Mahogany", which grows further south than the best "Spanish Mahogany". The trees are widely planted in many places for shade and ornament, and are common in Calcutta. A fine group of them may be seen at the south end of Hospital Road near the Presidency General Hospital. They are particularly beautiful when the new leaves appear in March and April. The inconspicuous flowers appear soon after the new leaves in April and May.

In the West Indies the bark of this tree is used as an astringent and as a substitute for cinchona.

**Swietenia macrophylla** King.

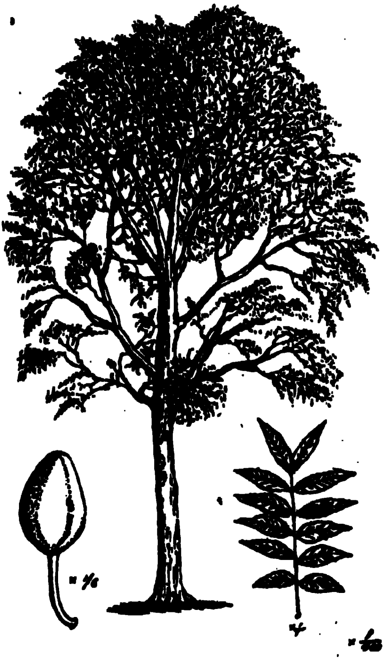
(Macrophylla in Greek means "having large leaves").

| | |
|---|---|
| Bengali, | *bara mahagni.* |
| English, | *bastard mahogany, large-leaved mahogany.* |

(Not mentioned in F.I. & F.B.I. B.P. Vol. I. p. 319.)

Leaves paripinnate, up to 2 feet long; leaflets 6 to 16, ovate-lanceolate, acuminate, slightly oblique, up to 8 inches long; petiolule very short; flowers ½ inch across in short axillary panicles; petals greenish-white, oblong, cuspidate; staminal tube whitish, teeth deltoid; disc bright red; capsule about 6 inches by 3 inches, erect.

This is a tall evergreen tree with rough bark, which flakes off in small patches, and leaves divided into two rows of rather large, narrow, pointed leaflets arranged in opposite pairs on a central midrib. The leaflets are dark green and shining when mature, and light green or reddish when young. The inconspicuous whitish flowers are borne in small open clusters among the leaves. Each flower has ten stamens combined into a small tube inside which there is a bright red disc. The fruit is a large, woody, club-shaped capsule containing a large number of seeds, which are winged at the upper end.



*SWIETENIA MACROPHYLLA*

The tree closely resembles the true Spanish mahogany (*Swietenia Mahagoni*) except for its very much larger and coarser leaves, and larger fruit. It is more hardy than the true mahogany, and grows more quickly, but its foliage lacks the delicacy of that of the Spanish mahogany, and does not assume such a beautiful shade of green when the leaves are young.

It also lacks the handsome spreading habit of growth of its more famous relation.

The timber of the bastard mahogany is lighter and less valuable than that of the Spanish mahogany, though it is moderately hard and of fairly good quality. The weight is about 35 lb. per cubic foot.

This tree was first determined as a separate species in Calcutta, when seeds were brought from Honduras and sown in the Royal Botanic Gardens. It seeds freely in India, and is now widely planted as an avenue tree in many places up to 2000 feet elevation. In Calcutta it is not uncommon, and several trees are to be found on the Maidan and elsewhere.

The new leaves mostly appear in March and the flowers in March and April. The very young leaves are usually reddish or pink in colour.

**CEDRELA.** (From "cedrus", the ancient Latin name of the cedar, the wood of which resembles the wood of some species of this genus.) A genus including 16 species of trees, natives of tropical Asia, America, and Australia, of which about 4 are found in India. The leaves are divided into separate leaflets arranged in two rows on a midrib (pinnate). The flowers are bisexual with 5 erect petals, and 4 to 6 stamens not joined into a tube. The fruit contains 5 cavities (cells), each with several winged seeds.

**Cedrela Toona Roxb.**

(Toona is the Indian vernacular name latinized).

| | |
|---|---|
| Bengali, | *tuni, tun, lud, tunna.* |
| Hindi, | *tun, tuna, tuni, lim, lud, mahalimbu, tunkajhar, mahanim.* |
| Urdu, | *tun.* |
| English, | *toon, Indian mahogany, Moulmein cedar, Singapore cedar, sandal neem, happy tree.* |

(F.I. p. 213. F.B.I. Vol I. p. 568. B.P. Vol. I. p. 320.)

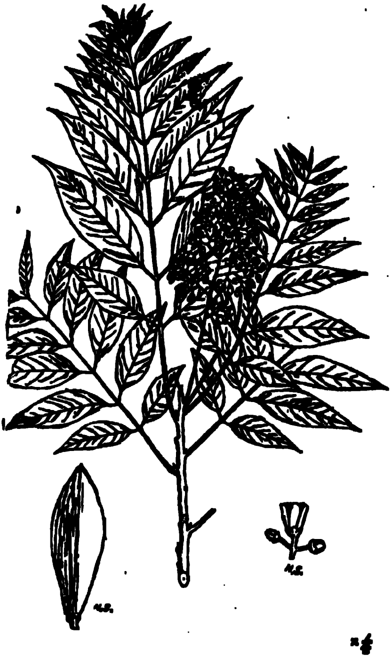
Leaves glabrous, paripinnate, 1 to 3 feet long; leaflets opposite or nearly so, 10 to 20, usually 14, lanceolate, acuminate, often falcate, entire or undulate, 2 to 7 inches long; petiolule ¼ to ½ inch long; flowers bisexual, in short terminal panicles, white, scented, ¼ inch long; sepals 5, ovate, acute; petals 5; stamens 5, inserted on an orange-coloured hairy disc; capsule oblong, smooth, ¾ to 1 inch long; seeds with membranous wings at both ends.

This is a rapidly growing tree, with thin, rough, dark grey-brown bark, spreading branches, and nearly evergreen foliage composed of long, graceful leaves divided into two rows of rather large, narrow, pointed leaflets arranged in opposite pairs on the midrib. The mature leaflets are bright green, but the young leaves are often reddish. Each leaflet is usually unequal-sided and curved, and its margins are sometimes wavy in outline. The small, white, honey-scented flowers grow in open clusters at the ends of the branches, each flower containing a diminutive orange-coloured disc from which the five stamens spring. The fruit is a small, elongated capsule containing a number of winged seeds.

This is one of the most useful timber trees in India, the wood being of a fine brick-red colour, soft and shining, with an even but open grain. It seasons readily and does not split or warp, nor is it eaten by white ants. It is much used for structural purposes, furniture and carving, and its fragrant scent makes it very suitable for cigar boxes. It is exported in large quantities from Burma to Britain, where it is known as "Moulmein cedar". Its weight is about 35 lb. per cubic foot.

The flowers yield a red and a yellow dye, which are largely employed for colouring cotton. The seeds are used to feed cattle, and the leaves are lopped as fodder.

The bark is used medicinally as a powerful astringent in the treatment of dysentery, and is also regarded as a febrifuge.



*CEDRELA TOONA*

The tree is a native of most of the hotter parts of India, Burma, Malaya and Australia. It is probably not truly wild near Calcutta, but is not uncommonly planted as a shade tree, for which purpose it is eminently suitable. A specimen may be seen (in 1944) on the east side of Mayo Road near its junction with Chowringhee.

The leaves fall in the early part of the cold weather and are replaced in December and January. The flowers appear in February and March. The fruits ripen towards the end of the rains.

# CELASTRACEAE

This is a small family of trees and shrubs, containing about 38 genera with 280 species, natives of tropical and temperate countries. The leaves are not divided into separate leaflets, are often leathery, and are usually set in opposite pairs. The flowers are small, and usually bisexual, with a calyx cleft into 4 or 5 segments, and 4 or 5 petals, overlapping in bud and spreading later, within which is a large disc supporting 4 or 5 stamens alternating with the petals. The ovary contains 2 to 5 cavities (cells). The fruit is variable in form. The seeds are usually brightly coloured.

The family takes its name from *Celastrus*, a genus of climbers represented by several species in India. It also includes *Euonymus*, which is represented in Britain by *Euonymus europaeus* Linn., the spindle tree, a common shrub in hedges and thickets.

**ELAEODENDRON.** (From the Greek "elaia", an olive, and "dendron", a tree, in allusion to the resemblance of the fruit of a typical species to an olive). This genus contains about 30 species of shrubs and trees, natives of Asia, Australia, South Africa, and tropical America. The stamens are 5 inserted under the edge of the disc, and the fruit is a fleshy berry, containing one seed.

**Elaeodendron glaucum** Pers.

(Glaucum in Latin means "grey-blue", or "sea blue".)

(F.I. p. 214. F.B.I. Vol. I. p. 623. B.P. Vol. I. p. 329.)

A deciduous tree ; leaves glabrous, generally opposite, more or less elliptic, coriaceous, crenate, usually about 3 inches long ; petiole about ½ inch long ; flowers numerous in axillary, dichotomous cymes, green, about ¼ inch across, 4- or 5-merous ; disc fleshy, angled ; stamens 5, inserted under the edge of the disc, filaments recurved ; drupe ovoid, ½ inch long, 1- to 2-seeded.

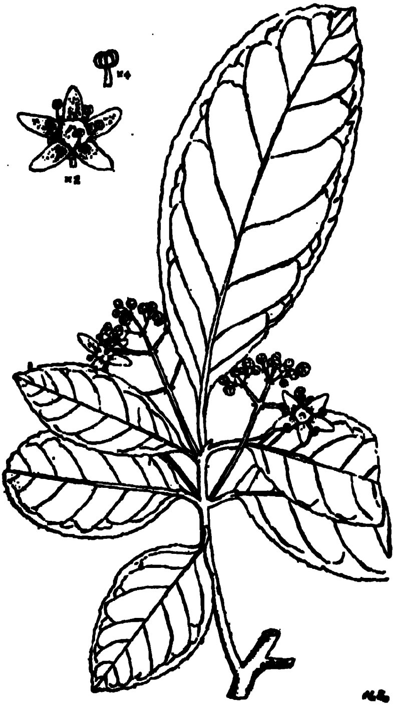
This is a graceful tree seldom exceeding a medium size and occasionally growing as a shrub. Its thin bark is grey or blackish in colour. The rather small green leaves are usually arranged in opposite pairs on the branches ; their stalks are short, and the leaves are generally broad with pointed ends and notched edges, but their shape and size are very variable. The small green flowers grow in short, open, branching clusters from near the bases of the leaves. The fruit is a yellowish-green berry somewhat resembling an olive.

The timber is fairly hard, even and close grained, and seasons well, but requires careful treatment because thin planks made of it are apt to warp. Having a pretty grain and a fine red colour it is used for cabinet work and picture frames. Its weight is about 45 to 50 lb. per cubic foot.

The root is widely believed to be a remedy for snake-bite, and the root-bark rubbed into a paste with water is applied to remove all kinds of swellings. The powdered leaves have a powerful sneezing action, and are made into a snuff to cure headaches, and to rouse women from hysteria. The root is used as an emetic and as a cure for pneumonia, but overdoses are said to be fatal. The bark contains tannin and is reputed to be poisonous, but a preparation of it is given in cholera.

The tree is a native of most of the hotter parts of India and Malaya. It is not wild near Calcutta, but is occasionally planted as an ornamental tree. Specimens may be seen in Barrackpore Park, and in the garden at Belvedere.

The flowers appear from March to June.



*ELAEODENDRON GLAUCUM*

# RHAMNACEAE

This is a family of about 40 genera with 500 species of trees and shrubs, distributed in all parts of the world. The branches are often armed with spines. The leaves are not divided into separate leaflets and may be arranged in opposite pairs, or otherwise. The flowers are small, often unisexual, and always green or yellow. The calyx is cleft into 4 or 5 triangular lobes. The petals and stamens are each 4 or 5 in number, and spring from a disc that lines the calyx tube, the stamens being opposite the petals. The fruits are variable in form.

The family takes its name from the genus *Rhamnus* (buckthorn), of which about 7 species are found in India and 2 in Britain.

**ZIZYPHUS.** (An Arabic name latinized). A genus of about 40 species of shrubs and trees, mostly natives of India and Malaya. The branches are armed with spines near the bases of the leaves, which are arranged alternately (*i.e.*, not in opposite pairs). The fruit is a fleshy berry containing 1 to 3 seeds. About 14 species are found in India.

In addition to the species described below *Zizyphus Oenoplia* Mill. (Bengali, *siakul*) is commonly found near Calcutta. This is a straggling shrub with pointed leaves covered with rusty down beneath, small black berries not more than ¼ inch across, and branches usually armed with straight spines growing singly from the bases of the leaves. It is often difficult to distinguish this shrub from *Z. Jujuba* when the fruits are not available. In addition *Zizyphus vulgaris* Lamk., the common jujube (Hindi, *titni ber* or *kandiari*), is said to be occasionally cultivated in Bengal. This is a small tree similar to *Z. Jujuba* in most respects, but with leaves free from down beneath. A number of varieties are cultivated in India for their fruit, which are said to be very like those of *Z. Jujuba*, but usually inferior. The better sorts are sometimes grafted on stocks of *Z. Jujuba*.

**Zizyphus Jujuba** Lam.

(Jujuba is a mediaeval Latin form of the Arabic word from which Zizyphus is derived).

| | |
|---|---|
| Bengali, | *ber, kul gachh, bogri, bor.* |
| Hindi, | *ber, beri.* |
| Urdu, | *ber.* |
| English, | *Indian jujube, Indian plum, Indian cherry, Chinese date.* |

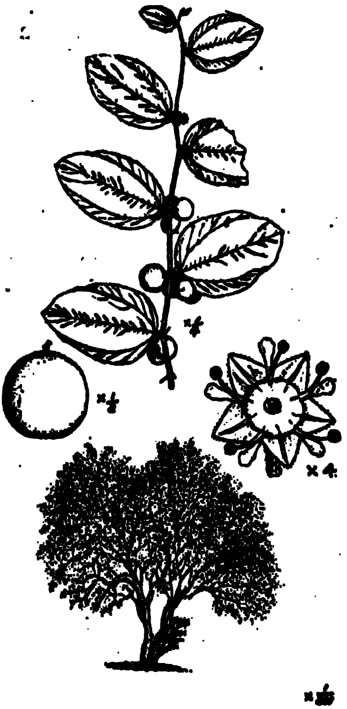
(F.I. p. 204. F.B.I. Vol. I. p. 632. B.P. Vol. I. p. 333.)

A middle-sized tree ; branches armed with stipular spines, which are usually in pairs, one bent, one straight ; branchlets, inflorescence, petioles and undersides of leaves densely white or tawny-tomentose ; leaves alternate, variable, oblong to nearly orbicular, obtuse or acute, entire or serrulate, subbifarious, up to 2½ inches long ; petiole short ; flowers in short, nearly sessile, axillary cymes ; calyx-lobes 5, spreading ; petals 5, subspatulate, narrow, reflexed ; disc 10-grooved ; fruit globose, 2-celled, fleshy, orange or reddish when ripe, ½ to ¾ inch diameter.

This middle-sized or small tree has nearly black bark covered with irregular cracks, dark green foliage, and a spreading, rounded crown. Its rather small leaves are very variable in shape, but are usually broad and sometimes almost circular in outline ; they are set on short stalks arranged alternately in two rows on opposite sides of the twigs, and at the base of each leaf there are sharp spines, which are sometimes solitary, but more often in pairs, one spine being straight and the other curved downwards. A white or reddish down densely covers the backs of the leaves and many other soft parts of the tree. The minute, greenish-yellow fragrant flowers grow in small clusters near the bases of the leaves. The fruit is a fleshy berry containing a single stone, within which are two seeds. The pulp round the stone is rather dry and mealy, and the flavour is acid unless the fruit is quite ripe. The thin, smooth skin is green until the fruit ripens and then turns reddish-brown or orange. The shape varies from oval to spherical ; the oval fruits (which usually grow on cultivated plants), when ripe resemble a small plum, but the unripe wild fruits have exactly the appearance of a very small green apple.

The wild ber produces a round acid fruit which is usually only eaten by poor people or used for making sherbet, but cultivation has much improved the size and flavour. Several cultivated varieties are grown with fruits of different shapes and flavours, the better kinds being more or less oval in shape. In Indian literature the fruit is regarded as very delicious and is included in the joys of Paradise, but only those who have acquired the taste can appreciate it; for it has a peculiar flavour that is not attractive to those not accustomed to it. The unripe fruits are pickled, and are made with the addition of salt and tamarinds into a condiment. The kernels are also eaten, and the ripe fruit is sometimes dried, powdered, and made into a sort of floury meal, especially in times of scarcity.

The bark is used for tanning purposes, and in Burma silk is dyed by means of the fruit. The branches are useful for making hedges, and the leaves are good fodder for cattle and goats. The leaves are also collected to feed silk-worms, and a silk obtained from a wild silk-worm's cocoon found on this tree was formerly highly prized for certain special purposes.



ZIZYPHUS JUJUBA

The timber is hard, strong, fine and close-grained, and reddish in colour. The weight varies from 43 to 58 lb. per cubic foot. It is largely used for saddle-trees, agricultural implements, sandals, tent pegs, golf clubs, and other purposes for which a hard, durable, close-grained wood is needed. The tree grows very quickly, and is an important forest tree in the dryer parts of India.

Medicinally the tree has a number of uses. The root and bark have tonic properties, and are used as a remedy for diarrhoea. The leaves are valued for treating asthma, wounds, and liver complaints. The fruits are said to be useful in fevers and for wounds and ulcers, while the flowers are used to treat eye troubles.

The ber is indigenous in many parts of Asia and Australasia, and is found throughout the hotter parts of India. It is common near Calcutta, in the vicinity of villages and elsewhere, though good fruits are not often seen except in districts to the north of the city. It is often found growing as a small bush, when it is sometimes easily mistaken for *Zizyphus Oenoplia* Mill., a common straggling shrub (see above under the description of the genus). The shrubby form of *Z. Jujuba* is said never to grow into a tree and has been described as a distinct variety under the name of *Z. Jujuba var. fruticosa* Haines. It has much smaller leaves and fruit than the arboreous form of the plant.

The flowers appear from August to October and the fruits ripen from January to March, when the branches are often heavily laden. The leaves are changed in April or May after the fruits have fallen.

## SAPINDACEAE

This is a family of about 120 genera with 1000 species, mostly trees and shrubs, natives of the tropics and subtropics. The leaves are usually alternately placed on the branches (not in opposite pairs), and are often divided into separate leaflets arranged in 2 rows on either side of a midrib (pinnate); except in the case of the species which are climbers, there is usually no terminal leaflet. The flowers are small and unisexual, the two sexes being generally borne on the same tree, but the female flower has sterile stamens which make it appear to be bisexual. The calyx is small and cup-shaped, or consists of 5 overlapping sepals. The petals usually number 4, and the stamens, which are from 4 to 10 in number, are inserted between the ovary and a disc. The ovary usually contains 3 cavities (cells). The fruits take various forms.

Over 20 genera of this family are found in India. In addition to the trees described below, *Allophyllus serratus* Radlkofer (Bengali, *rakhal phul*), a straggling shrub with leaves divided into 3-toothed leaflets, is not uncommon near Calcutta; and *Cardiospermum Halicacabum* Linn. (Bengali, *shibjhul*), a small herbaceous climber with leaves divided into nine toothed leaflets, in 3 groups of 3, and fruits consisting of inflated capsules, is very common in Bengal.

**FILICIUM.** (From the resemblance of the leaves to the *filices*, or ferns). This is a genus of 3 species of trees, natives of Asia and Africa, with leaves divided into separate leaflets arranged in opposite pairs on either side of a broadly winged midrib. The fruit is a small berry containing one seed.

This genus was included by early authorities in the family *Burseraceae.*

**Filicium decipiens** Thw.

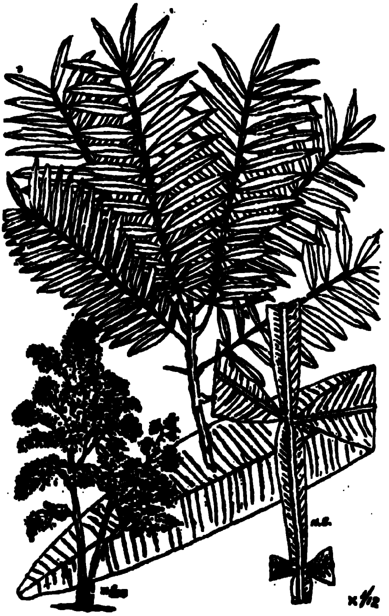
(Decipiens in Latin means "deceptive", or "misleading", owing to the difficulty in classifying this tree).

| | |
|---|---|
| Hindi, | *katu, puveras.* |
| English, | *fern tree, fern-leaf tree.* |

(F.B.I. Vol. I. p. 539. Not in F.I. & B.P.)

Leaves paripinnate ; leaflets 12 to 16, narrowly elliptic, glabrous, 4 to 6 inches long, opposite ; rachis broadly winged between each pair of leaflets, wing narrowing towards base ; flowers numerous, minute, unisexual, pentamerous, in narrow axillary panicles ; stamens 5, inserted within the disc ; drupe ovoid, apiculate, shining, ⅓ inch diam., 1-seeded.

This handsome evergreen tree attains a fair size and has a compact habit of growth. The bark is blackish, and flakes off in small pieces to show a reddish brown colour beneath. The dark green, shining leaves are divided into separate leaflets arranged in opposite pairs on either side of a broadly winged midrib, the whole leaf being strongly reminiscent of the leaf of a fern. From the axils of the leaves spring minute white flowers in inconspicuous, erect, branching clusters. The fruit consists of a small, shining, egg-shaped berry, which turns purple when ripe and contains one seed.



*FILICIUM DECIPIENS*

The timber is very hard and strong, weighing about 60 lb. per cubic foot. It is useful for building purposes.

The tree is a native of Western India, Ceylon, and eastern tropical Africa. It is widely cultivated in the tropics as an avenue tree, and is said to be grown as an ornamental pot plant. It is occasionally planted in Calcutta, but is too slow-growing to be popular as a shade tree. Some fine specimens may be seen in the Calcutta Zoo.

The flowers appear in February, and the fruit ripens in March and April, but the tree seldom, if ever, bears fruit in Calcutta.

**BLIGHIA.** (Named after W. Bligh, a British mariner who wrote on the South Seas about A.D. 1792). A small genus of tropical trees and shrubs, of which one species is cultivated in many hot countries for its fruit. The leaves are divided into 2 rows of leaflets arranged in opposite pairs on either side of the midrib (paripinnate). The flowers are borne in slender clusters from the axils of the leaves, the calyx being deeply divided into segments which scarcely overlap. The fruit is an elongated capsule with 3 lobes.

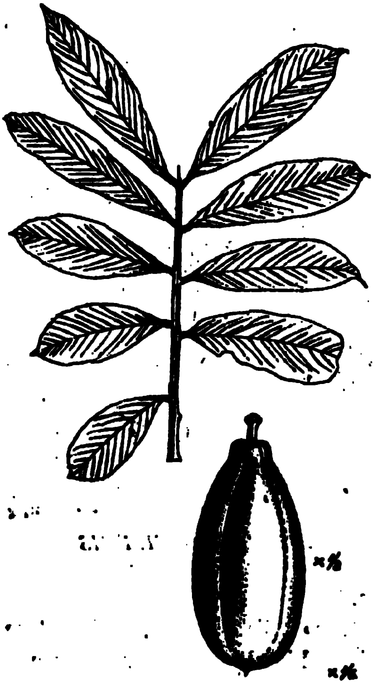
**Blighia sapida** Koen. *Syn.* Sapindus obovatus *W. & A.*

(Sapida is Latin meaning "having a pleasant taste").

English, *akee fruit.*

(Not mentioned in F.I., F.B.I. & B.P.)

Leaves paripinnate; leaflets 6 to 10, obovate-oblong, entire, glabrous, the terminal pair up to 8 inches long, the lower pairs smaller; petiolules very short; flowers pubescent, in axillary racemes, fragrant; calyx segments 5; petals 5, greenish-white, oblong; fruit a capsule opening by 3 sutures, about 3 inches long; seeds 3, globose, shining.



*BLIGHIA SAPIDA*

This is a medium-sized tree with smooth grey bark, and bright green, shining leaves divided into two rows of leaflets arranged in opposite pairs on short stalks on either side of the midrib. Each leaflet is broadest near its apex and tapers towards its base, the pair of leaflets at the outer end of the leaf always being the largest and the remainder diminishing in size towards the base of the leaf. The young leaflets are reddish in colour but soon turn a bright glossy green. The small, greenish-white, intensely fragrant flowers are borne in rather showy clusters from the axils of the leaves. The fruit is a curious-looking capsule, longer than broad, with three pronounced lobes, and usually magenta-red in colour when ripe; it contains three spherical, shining, black seeds, round the base of which is a firm, cream-coloured, fat-like substance, which is the edible part of the fruit.

In the West Indies this succulent portion is fried with butter, or boiled and flavoured with salt and pepper, when it is considered a great delicacy. Care must however be taken to see that the fruit is neither over-ripe nor under-ripe when eaten, and it must always be fresh-picked, for otherwise it becomes unsafe to eat. A pink integument found between the lobes of the fruit must be removed before eating.

The tree is a native of Guinea, but is now grown in many hot countries. It is occasionally planted near Calcutta, and a specimen may be seen in the Royal Agri-Horti. Gardens at Alipore.

The flowers and fruit appear in the hot weather.

**LEPISANTHES.** (From the Greek "lepis", a scale or husk, and "anthos", a flower). A genus of about 20 species of trees and shrubs, natives of tropical Asia. The leaves are divided into several leaflets set in opposite pairs on either side of a central midrib (paripinnate). The leaflets have smooth edges (entire). The flowers are unsymmetrical, with 5 sepals which overlap one another, and 4 or 5 petals. The fruit contains 3 chambers (cells), but is not lobed as in the genius *Blighia*.

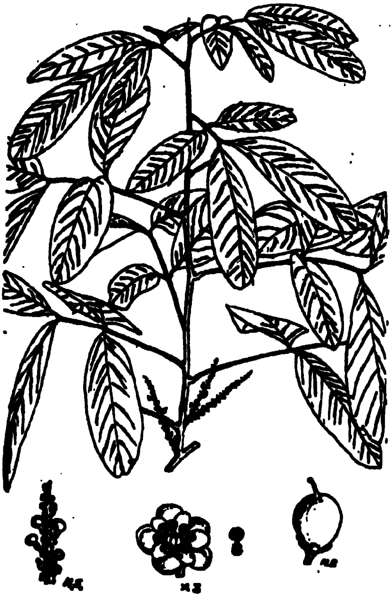
**Lepisanthes tetraphylla** Radlk. *Syn.* Hemigyrosa canescens *Thw.* Molinaea canescens *Roxb.* Cupania canescens *W. & A.*

(Tetraphylla is from the Greek meaning "with four leaflets". Canescens is Latin meaning "becoming white, or hoary".)

(F.I. p. 320. F.B.I. Vol. I. p. 671. Not in B.P.)

A medium-sized, polygamo-monoecious tree; leaves alternate, pinnate, up to 15 inches long; leaflets usually 4 (sometimes 2, 6, or 8), the terminal pair the larger, elliptic, obtuse, shining above, up to 10 inches long; flowers in sessile, crowded panicles; sepals 5, erect, concave, the 2 outer smaller; petals 4 or 5, concave, shaggy at the claw; disc unilateral; stamens 8, or in male flowers 6 to 10, rather longer than the petals; stigma trigonous, blunt; fruit subglobose, velvety, ochre-coloured, up to 1 inch diam.; seeds 2 to 5, set in white, translucent pulp.

This is an evergreen tree, of moderate size, usually with a crooked trunk, spreading branches and a compact, rounded crown of dark green shining foliage. The fairly smooth, dark brown bark flakes off in large pieces and exposes a much paler surface beneath, but the trunk is often pale greyish in general appearance near its base owing to irregular patches of light colour, and is gnarled with uneven bumps and fissures. The large leaves are usually divided into four leaflets set in two pairs on either side of a central midrib, the pair of leaflets at the outer end of the midrib being the larger. Each leaflet is narrow in outline but more or less blunt at the tip, and has slightly uneven edges. The upper surface is dark green and glossy, but the underside is paler and of a duller texture. The small whitish flowers are borne in branching clusters set close to the larger branchlets and almost concealed by the dense foliage. Each flower has five overlapping sepals, and four or five minute concave petals, which are narrow and hairy at the base.



*LEPISANTHES TETRAPHYLLA*

The round, pale yellow fruits have thin, soft, velvety skins containing several large seeds each enclosed in white translucent pulp, the whole interior somewhat resembling that of a mangosteen, but on a much smaller scale. The pulp has a sweet taste but no definite flavour, and, though the fruit is considered edible and is much appreciated by birds and flying-foxes, it seems to be seldom eaten by man.

The flowers appear in March and April, and the fruits ripen in May, when they are often produced in great profusion. The ground beneath the tree is then littered with the skins and seeds that have been discarded by the creatures that eat the fruits.

The wood is white, fairly soft, and even-grained. It is used in house-building but is not very serviceable. It weighs about 60 lb. per cubic foot.

The tree is a native of Burma, Ceylon and South India, but has only recently been introduced into Bengal. A fine specimen grows in the Royal Agri-Horticultural Gardens in Alipore, and in recent years a number of young trees have been planted in Calcutta streets, especially in Ballygunge.

**SCHLEICHERA.** (After J. C. Schleicher, a Swiss botanist.) This genus contains only one species, a tree with minute petalless flowers, a dry crustaceous fruit containing only 1 seed, and leaves divided into leaflets set in opposite pairs on either side of a midrib (pinnate).

**Schleichera oleosa** (Lour.) Merr. *Syn.* S. trijuga *Willd.*

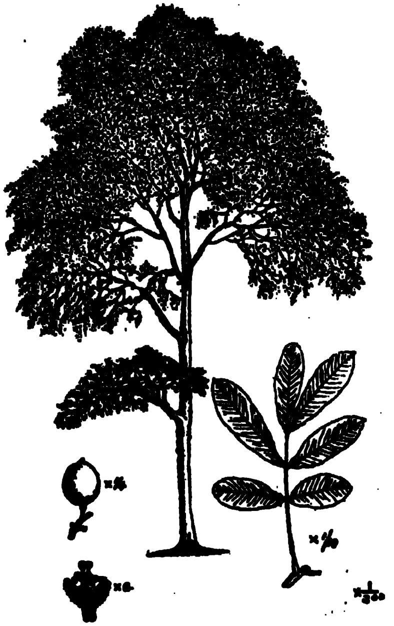
(Trijuga in Latin means "three yokes", in allusion to the leaflets which are often in 3 pairs. Oleosa is Latin meaning "rich in oil").

| | |
|---|---|
| Hindi, | *kusum, gausam, kosum.* |
| English, | *lac tree, gum lac tree, Ceylon oak, honey tree.* |

(F.I. p. 331. F.B.I. Vol. I. p. 684. B.P. Vol. I. p. 345.)

A large deciduous tree; leaves paripinnate, 8 to 16 inches long; leaflets opposite, sessile, elliptic, the lowest pair 1 to 3 inches, the terminal pair 6 to 9 inches long; flowers minute, yellowish green, fascicled on interrupted racemes, polygamo-dioecious, apetalous; racemes 2 to 6 inches long; stamens 6 to 8; style 3- to 4-cleft; fruit smooth or echinate, 1 inch long; seed compressed, brown, 3/5 inch long.

This is a large tree with thick, smooth, grey bark, a short, fluted trunk, and a dense and shady crown. Its branches are leafless for a short time in the cold weather, and the new leaves appear in February or March at first they take various beautiful shades of red, but they soon turn light green, and ultimately become a fairly dark green, which is often brightened by scattered tufts of new leaves with fresh red or pale green tints. The leaves are divided into separate pointed leaflets set in two, three, or four opposite pairs on a central midrib; the leaflets are attached directly to the midrib without stalks, the terminal pair always being the largest and the lowest pair the smallest. The minute yellowish-green flowers grow in short, dense clusters, which are arranged in numerous spikes springing from the twigs among the leaves. The flowers are either male or hermaphrodite, the two kinds usually being found on separate



*SCHLEICHERA OLEOSA*

trees. The fruit is a smooth or prickly, hard-skinned berry, roundish but rather elongated in shape, with a point at the tip. The prickles that sometimes appear on the fruit seem to be galls caused by some insect.

The tree is a native of the low hills of the Himalayas, Central India, the Western Peninsula, Burma and Ceylon. It is an important forest tree owing to its various valuable products, and especially because the lac grown on it is considered to be the best obtainable.

The timber is very hard, strong, and durable, weighing about 68 lb. per cubic foot. It is used for the rollers of oil and sugar mills, rice pounders, agricultural implements, and cartwheels. It seasons well and takes a good polish.

The acid pulp surrounding the stone of the fruit has a pleasant flavour, and is often eaten. The young fruits are pickled. The leaves and twigs are lopped for cattle fodder. The seeds yield an oil, which is used for cooking and for burning in lamps, and is said by some to be the macassar oil of hairdressers. A dye is obtained from the flowers.

Medicinally the oil is used to cure skin diseases, rheumatism, and headache, and also for promoting the growth of the hair. The bark is employed to cure skin troubles and inflammation, and the powdered seeds to remove maggots from wounds of animals.

The tree is not wild in lower Bengal, but is often planted in Calcutta. Specimens may be seen on to the west of Mayo Road, and on Strand Road near St. George's Gate, Fort William.

The flowers appear with the new leaves in February and March. The old leaves turn pale yellow before falling. The fruits ripen during the rains.

**EUPHORIA.** (From the Greek "eu", well, and "phoreo", I bear, because the plants *bear well* their edible fruits). This is a genus of about 6 species of trees and shrubs, natives of India, Malaya, and South China. The leaves are divided into two rows of leaflets arranged in opposite pairs on the midrib (paripinnate). The small flowers are either male or bisexual, with cup-shaped calyces divided into 4 or more overlapping segments. The fruit is contained in a more or less hard skin, which is generally covered with small raised points, and does not split open (indehiscent). The seeds are more or less spherical, and are enclosed in a layer of pulp.

This genus was formerly included in the genus *Nephelium*, from which it has now been separated by its overlapping calyx segments.

**Euphoria Longana** Lam. *Syn.* Nephelium Longana *Camb.* Scytalia Longan *Roxb.*

(Longana is a Chinese name).

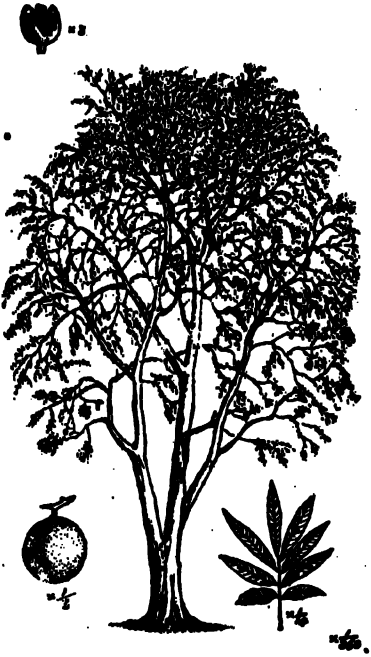
Bengali, *asphal*.

English, *longan, eyeball tree, dragon's eye, burdock, soap-nut.*

(F.I. p. 329. F.B.I. Vol. I. p. 688. B.P. Vol. I. p. 346.)

**Leaves paripinnate, alternate; leaflets opposite, 4 to 10, coriaceous, shining above, elliptic, ovate-oblong or lanceolate, usually rather obtuse at both ends, 2 to 12 inches long; petiolules very short; panicles terminal and axillary; flowers 1/10 inch diam.; calyx deeply 5- or 6-lobed, tomentose; petals spathulate, about equalling the calyx; stamens 6 to 10; ovary 2- to 3-lobed, hairy; fruit globose, brown or yellowish-red, ½ inch diam., with rough, brittle pericarp; seed 1, with succulent aril.**

This is a middle-sized evergreen tree with smooth, yellowish-grey bark, spreading branches, and dense, dark green, shining foliage. The leaves are divided into from two to five pairs of leaflets arranged in two rows on either side of the midrib. The leaflets vary greatly in shape and size, but are always narrow and rather unequal-sided near the base. The young leaves are reddish in colour, but they soon turn green. The very small yellowish-white flowers are borne in large open clusters at the ends of the branches and among the leaves. Two kinds of flowers are produced, male and bisexual, both sorts being found mingled on the same tree. The spherical fruits are borne in pendulous clusters rather like grapes; they have a rough, thin, scale-like rind containing a large black seed surrounded by a thin layer of white juicy pulp. They resemble a small and very inferior litchi, and are much eaten, especially by children, but the pulp is very scanty and only slightly sweet.



*EUPHORIA LONGANA*

The timber is hard and durable, but is little used, though it is said to take a fine polish and to be useful for furniture. Its weight is about 59 lb. per cubic foot.

Medicinally the fruit is reputed to be nutrient, stomachic, and anthelmintic. In Indo-China the dried fruit is used as a tonic and brain-stimulant.

The flowers appear in March and April, and the fruit ripens in June.

The tree is a native of south-western India, Ceylon, Burma, and East Bengal. It is widely cultivated in the tropics, and is commonly planted in and about Calcutta, chiefly for ornament and shade. A number of trees may be seen on the Tollygunge Golf Course.

**LITCHI.** (A Chinese name). This is a genus containing a single species which was formerly included in the genus *Nephelium*. It is now distinguished by its calyx almost devoid of lobes, and the absence of petals, whereas the calyx of *Nephelium* is deeply cleft into 4 or more segments, and minute petals are present.

**Litchi chinensis** Sonner. *Syn.* Nephelium Litchi *Camb.* Scytalia Lichi *Roxb.*

(Litchi is a Chinese name. Chinensis means "from China").

| | |
|---|---|
| Bengali, | *litchu.* |
| Hindi, | *litchu.* |
| English. | *litchi* |

(F.I. p. 328. F.B.I. Vol. I. p. 687. B.P. Vol. I. p. 346.)

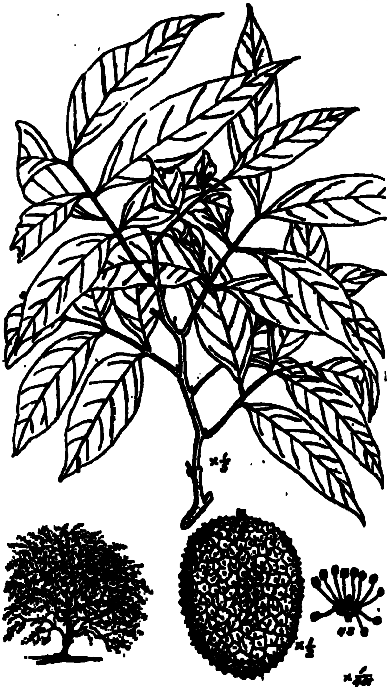
A small tree ; leaves paripinnate ; leaflets 4 to 12, opposite or alternate, oblong-lanceolate or ovate, acuminate, glabrous, base cuneate, pale beneath, up to 6 inches long ; flowers minute, in terminal panicles ; calyx 4- to 5-dentate ; petals 0 ; disc glabrous ; stamens 6 to 10 ; fruit red or pink when ripe, 1 inch diameter or more ; pericarp brittle, tubercled ; seed 1, axil large, fleshy.

The litchi is an evergreen shrub or a small tree with thin, grey, rough bark, spreading branches, and dark green, glossy foliage. Its leaves are very variable in size and shape, but are always divided into two rows of leaflets arranged in pairs on either side of a central midrib. The leaflets are pointed and dark green and shining above but pale and glaucous beneath. The minute, greenish flowers have no petals and are very inconspicuous ; they grow in small sprays at the ends of the branches, and are followed by large clusters of roundish fruit contained in thin, brittle rinds, which are covered with small raised points, and are usually pink or crimson when ripe. Each fruit contains a single large black seed surrounded by a white, juicy, translucent pulp which is sweet, delicately flavoured, and reminiscent of a large white grape. The fruits turn a dull brown colour soon after being picked.

Litchis are said to be grown to perfection only in one province of China but excellent fruits are obtained in most years from the neighbourhood of Calcutta, and are generally considered one of the most delicious of local products. In India the fruit seems to be always eaten freshly picked, but in China they are often dried, when they become blackish in colour, in which state they may be bought in London and other western cities.

The timber is red in colour, and hard. It weighs about 60 lb. per cubic foot.

In China the tree has many medicinal uses. The root, bark, and flowers are employed to make a gargle to cure throat troubles, and the green fruit is believed to help children in small-pox. The seed is used to cure intestinal troubles, and to relieve neuralgic pains.



*LITCHI CHINENSI*

The litchi is now widely cultivated in India, having been introduced from South China. In many parts of the country it fails to produce good fruit, but in lower Bengal its results are usually satisfactory, provided the trees are netted well before the fruits are ripe in order to protect them from the attacks of birds.

The flowers appear in February and March, and the fruit ripens in May or at the end of April. The young leaves appear at various times throughout the year, and are often coloured pink, or a delicate shade of pinkish yellow. The plants are usually propagated by gootee or by grafting. It is said that if they are to be grown from seed, the seed must be quite fresh when sown.

**SAPINDUS.** (From the Latin "sapo", soap, and "indus", Indian). This is a genus of 11 species of trees, natives of tropical Asia and America. The leaves are divided into separate leaflets set in opposite pairs on a midrib (paripinnate). The 5 sepals are unequal in size, and overlap one another when in bud. The small petals are 4 to 5 in number, and there are usually 8 hairy stamens on a fleshy disc. The fruit consists of 1, 2, or 3 more or less separate divisions (carpels), which are smooth and usually fleshy, and contain a substance known as "saponin", which makes a lather with water.

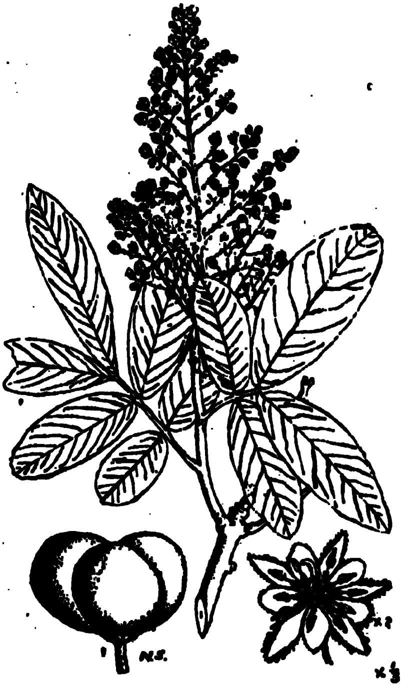
**Sapindus laurifolius** Vahl. *Syn.* S. trifoliatus *Linn.* S. emarginatus *Vahl.*

(Laurifolius means "with laurel leaves". Trifoliatus means "with 3 leaves", or in this case "with 3 pairs of leaflets".)

| | |
|---|---|
| Bengali, | *bararitha.* |
| Hindi, | *ritha.* |
| English, | *soapnut.* (This name is also given to S. *Mukorossi*). |

(F.I. p. 331. F.B.I. Vol. I. p. 682. B.P. Vol. I. p. 344.)

Leaves alternate, paripinnate; leaflets 4 to 6, subcoriaceous, elliptic, generally obtuse and emarginate, sometimes acute, 3 to 7 inches long, those of the terminal pair largest; inflorescence rusty-pubescent, terminal, panicled; flowers polygamous, 1/6 to 1/5 inch long, white, hairy; ovary tomentose; drupes 2 or 3, fleshy, slightly united, glabrous and wrinkled when ripe.



SAPINDUS LAURIFOLIUS

This is a large, handsome deciduous tree with grey bark covered with rough scales. The rather short leaves are divided into two or three pairs of leaflets, of which the terminal pair is always the largest. The leaflets are usually rounded at the tip with a distinct notch at the end of the central nerve, and are downy on the lower surface, but there is a variety with hairless leaflets terminating in a tapering point. Many minute, dingy white flowers grow in rather large, open clusters at the ends of the branches. There are two kinds of flower, male and bisexual, both kinds being found in the same cluster, the males predominating. The fruit consists of two, or more usually three, almost spherical berries, which are partially joined, and are covered with reddish hairs when young, but are hairless and wrinkled when ripe. Each berry contains one hard, smooth, black seed.

The fruits contain a substance known as "saponin" that forms a lather with water, and they are largely used as a substitute for soap, being actually preferred to the best soaps for washing woollens and delicate fabrics. They are also useful as a detergent for washing cloth before dyeing it.

The timber is yellow and hard, weighing about 64 lb. per cubic foot. It is not much used, but is occasionally employed for building.

The fruit is valued for a great variety of medicinal purposes, especially as an emetic, and as a remedy for asthma, hysteria, and epilepsy. Externally it is given as a remedy for the stings and bites of poisonous insects, and is believed to be useful in cases of snake-bite. For scorpion sting the fruit is given internally while the smoke from the burning nut is being inhaled.

The tree is a native of Southern India. It is said by Sir David Prain to be cultivated in Bengal and to be occasionally planted near villages in the neighbourhood of Calcutta, but it is certainly not common, and may no longer be found there except in the Royal Botanic Garden.

The flowers appear from October to December, and the fruits ripen in the hot season. When ripe they have a strong, sweet scent like over-ripe strawberries.

**Sapindus Mukorossi** Gaertn. *Syn.* S. detergens *Roxb.*

(Mukorossi is a Japanese name. Detergens in Latin means "cleansing".)

| | |
|---|---|
| Bengali, | *ritha.* |
| Hindi, | *aritha, dodan, kanmar, ritha.* |
| English, | *soapnut,* (This name is also given to *S. laurifolius*). |

(F.I. p. 332. F.B.I. Vol. I. p. 683. B.P. Vol. I. p. 344.)

Leaves alternate, paripinnate, up to 18 inches long; leaflets alternate or opposite, 10 to 16, lanceolate, acuminate, glabrous, often slightly oblique, 2 to 6 inches long; petiolules short; flowers ciliated, mostly bisexual, 1/10 inch diam., white or purple, in terminal panicles; drupes fleshy, solitary or in pairs, subglobose, ¾ inch diam.

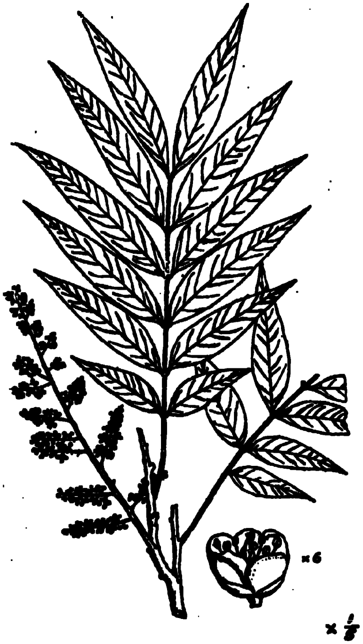
This is a handsome deciduous tree, sometimes attaining 60 feet in height, with grey, rather rough bark, and long slender leaves divided into two rows of narrow, pointed, slightly unequal-sided leaflets, which are arranged close together on the midrib, sometimes, but not usually, in opposite pairs. The minute, purple or greenish-white flowers grow in open, much branched clusters at the ends of the twigs, the flowers being of two kinds, male and bisexual, the bisexual the more numerous. The fruit consists of spherical fleshy berries, yellow when ripe, borne either singly or in pairs, each berry containing a single, round, black seed.

This tree is easily mistaken for the toon (*Cedrela Toona*), which it closely resembles in foliage, but it may be distinguished by its comparatively smooth, grey bark, much smaller flowers, and fleshy fruits.

The fruits of this tree, as in the case of all members of the genus, contain saponin, which has the valuable property of forming a lather with water. The fruits are used for the same purposes as those of *S. laurifolius*, namely, washing clothes, especially woollen and delicate articles, and the hair. They are considered superior to the best soap for these purposes.

The timber is compact, close-grained and fairly hard, weighing about 44 lb. per cubic foot. It is seldom used. The leaves are given to cattle as fodder.

The fruit and seeds are regarded as a cure for epilepsy. The seeds are supposed to remove tan and freckles from the skin, and a solution of the fruits is a remedy for skin diseases. The powdered seeds are said to be a good insecticide.



*SAPINDUS MUKOROSSI*

The tree is a native of China and Japan. It is cultivated throughout Northern India, and is said by Sir David Prain to be found occasionally near Calcutta, but it is certainly uncommon in lower Bengal. The flowers appear in May and June.

# ANACARDIACEAE

This is a family comprising about 60 genera with 500 species of trees and shrubs, mostly natives of the tropics, of which about 20 genera are found in India. The plants often contain milky and acrid juices, which in some cases are capable of raising blisters on the skin. The leaves are not arranged in opposite pairs, and are very various in structure. The small flowers may be unisexual or bisexual, but are always borne in branching clusters (panicles). The calyx is cleft into from 3 to 5 segments, alternating with which are as many petals. The stamens are usually as many as the petals and alternate with them, the stamens being inserted under a disc. The ovary is usually free from the calyx and contains from 1 to 6 cavities (cells), each holding a single seed. The fruits are fleshy, and sometimes large, usually containing a single seed.

The family is named after the genus *Anacardium*, which includes *Anacardium occidentale* Linn., the cashew nut (Bengali, *hijli badam*), a small evergreen tree, a native of America, cultivated in various parts of India for its nuts and occasionally planted in Bengal. The small kidney-shaped, edible nut of this tree grows at the apex of a greatly swollen, pear-shaped stalk, much larger than the nut. The stalk is juicy and edible.

**LANNEA.** (From the vernacular name in Senegambia of one species.) This is a genus of about 15 species of deciduous trees with stout, soft branches, mostly natives of Africa, of which one only is found in India. The leaves are few, clustered at the ends of the branches, and divided into two rows of leaflets with smooth edges and arranged in opposite pairs on the midrib with a terminal leaflet at the apex (imparipinnate). The flowers are unisexual, the males having 8 to 10 stamens, and the females 3 or 4 styles. The fruit is a small flattened berry containing a single seed.

**Lannea grandis** (Dennst.) Engl. *Syn.* Odina Wodier *Roxb.*

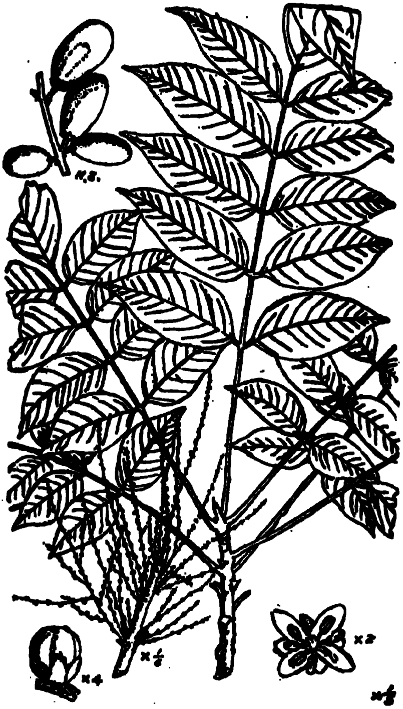
(Grandis is Latin meaning "large". Wodier is the Tamil name of this tree.)

| | |
|---|---|
| Bengali, | *jial, jiol, jir, jival, bhadi, bohar, ghadi, lohar.* |
| Hindi, | *kiamil, kimul, kamlai, kashmala, jhingan, mowen, mohin, moyna, ginyan.* |

(F.I. p. 336. F.B.I. Vol. II. p. 29. B.P. Vol. I. p. 354.)

A tree with thick starchy twigs; leaves imparipinnate, 12 to 18 inches long; leaflets 7 to 9, petiolulate, oblong-ovate, caudate-acuminate, opposite, entire, 3 to 6 inches long, without an intramarginal nerve; flowers small, monoecious or dioecious, in compact fascicles, greenish; racemes numerous at ends of branches; female racemes simple, male compound; calyx 4- or 5-cleft, lobes ciliate; petals oblong, pink and greenish yellow; stamens 8 to 10; styles 3 or 4, short, stout; drupe reniform-oblong, ½ inch long.

This is a deciduous tree with rather thick, smooth, grey or whitish bark, which flakes off in small pieces, and with a straggling ungainly habit of growth. In Bengal the tree is usually only of small dimensions, but it is said to grow to a large size in more suitable climates. The leaves fall during the cold weather, and the tree remains bare and ugly, until in March or April the small yellowish-green flowers, tinged with pink, appear in numerous spikes or sprays, which radiate from the tips of the rather thick soft twigs. The flowers are unisexual, the two sexes being often borne on different trees, and if on the same tree, usually on separate branches. Most of the female flowers grow on short unbranched stalks, and most of the male flowers on longer, branching stalks. The handsome foliage appears after the flowers, and often not till May or June, when the last of the flowers have fallen. Like the flowers, the leaves are clustered at the ends of the branches ; each leaf is divided into several narrow leaflets with smooth edges and long tapering points, the leaflets being arranged in opposite pairs on either side of a midrib with a terminal leaflet at the tip. The small, rather flat berries are usually borne in large numbers from the female trees, or female branches, and persist for a long time ; they are red or brownish when ripe, and each contains a hard stone.



*LANNEA GRANDIS*

The soft branches of this tree contain large quantities of starch, and it is, therefore, easy to propagate the tree by making cuttings and simply planting them in damp soil. For this reason it is common in and about villages, and is often used to make hedges and to mark boundaries.

A gum which exudes from the bark is used in calico-printing, as a size for hand-made paper, and as an addition to lime for white-washing. The bark yields a dye which is employed to colour silk a brown or golden colour, and is also used in tanning. The leaves make good fodder for cattle and elephants, and in some places the tree is pollarded for this purpose.

The bark is astringent and is used to cure ulcers, sprains, bruises, skin diseases, and dysentery. The gum, beaten up with cocoanut-milk, is also applied to bruises and sprains. The juice of the green branches, mixed with tamarinds, is given as an emetic in cases of narcotic poisoning. A decoction of the bark is considered a cure for toothache, and the powdered bark is used as tooth-powder. The leaves are applied to elephantiasis of the leg, and after being boiled are regarded as a remedy for all kinds of pains and swellings.

This tree is indigenous throughout the hotter parts of India and is abundant in lower Bengal.

**SPONDIAS.** (A Greek name used by Theophrastus). This is a genus of about 6 species of deciduous trees, natives of the tropics, of which about 4 species are found in India. The leaves are divided into separate leaflets arranged in opposite, or nearly opposite, pairs on either side of the midrib with a terminal leaflet at the tip (imparipinnate). The small flowers grow in open erect clusters at the ends of the branches, and are of two kinds, male and bisexual, both sorts being found on the same tree (monoecious). There are 8 to 10 stamens inserted beneath a broad disc, and 4 or 5 styles. The fruit is a fleshy berry containing a hard stone holding from 1 to 3 seeds.

**Spondias mangifera** Willd. *Syn.* S. pinnata *Kurz.*

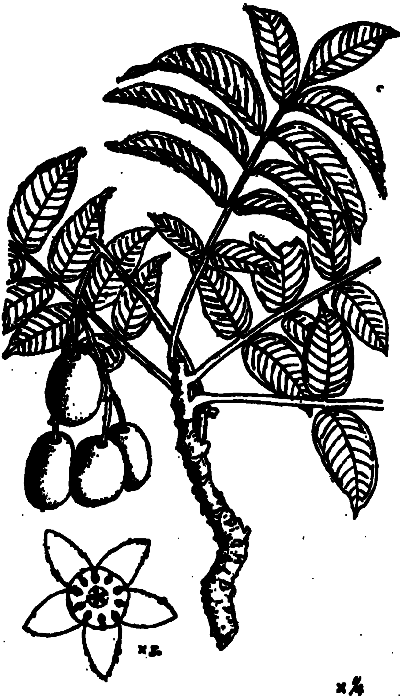
(Pinnata is Latin meaning "feathered", in allusion to the arrangement of the leaflets. Mangifera is Latin meaning "mango-bearing".)

| | |
|---|---|
| Bengali, | *amra, ambra, amna.* |
| Hindi, | *amara, ambodha, ambra, amra.* |
| English, | *hog plum, bile tree, wild mango, traveller's delight.* |

(F.I. p. 387. F.B.I. Vol. III. p. 42. B.P. Vol. I. p. 356.)

Branchlets stout; leaves alternate, glabrous, imparipinnate, 1 to 1½ feet long, scented like mango; leaflets 7 to 13, oblong, acuminate, entire, 3 to 6 inches long, with an intramarginal nerve; flowers pentamerous, whitish, polygamous, clustered on stout branches of panicles, ¼ inch diam.; calyx 5-toothed; petals 5, oblong; stamens 8 to 10; drupe 1½ to 2 inches long, yellow when ripe, smooth.

This is a deciduous tree with a rather straggling habit, and smooth, grey, aromatic bark marked with short, shallow, longitudinal wrinkles. In Bengal the tree usually reaches only middle size and is often found growing as a large shrub, but in some climates it is said to grow to be a handsome tree of considerable height. Its leaves are clustered near the ends of the rather soft, greenish branchlets, and are divided into two rows of large leaflets arranged in opposite pairs on either side of a midrib with a terminal leaflet at the apex. The leaflets have short stalks, are rather narrow in outline with projecting tips, and are widely spaced along the midrib; they are remarkable in having a vein which runs round the leaflet just within the margin, joining the tips of all the small veins which run outwards from the central vein, a characteristic that enables the leaves of this tree to be easily distinguished from the very similar leaves of *Lannea grandis*. Many little greenish-white flowers grow on the stout branches of large sprays, which appear at the ends of the twigs when the tree is leafless in February and March. The flowers are of two kinds, male and bisexual, both sorts being found together on the same tree. The fruits are smooth berries about the size and shape of a hen's egg ; they are yellow when ripe, or sometimes green mottled with yellow and black, and contain a large stone surrounded by coarse fibre and some acid pulp. The tree may easily be recognised by the strong smell of mango which pervades it.



*SPONDIAS MANGIFERA*

The flavour of the fruit has been described as like that of an exceedingly bad mango, but nevertheless it is sometimes eaten raw ; though more often it is used while still green to give an acid taste to curries, or made into a pickle with mustard-oil, salt, and chillies. There are several varieties, some of which are said to give fruits which are sweet and pleasant if the part of the pulp just below the skin is first removed and the fruit is eaten at exactly the right time. Cattle and deer are very fond of the fruits, and in jungles where deer are found, large heaps of the stones dropped by the deer are often seen.

The bark is used as a remedy for dysentery and also, ground and mixed with water, as an embrocation to cure rheumatism. The fruit is eaten to relieve dyspepsia and as a preventive of scurvy, and the juice of the leaves is considered a cure for earache. The bark is commonly believed to be a remedy for snake-bite.

The wood is soft and almost useless. A gum obtained from the bark is sometimes used as an adhesive. The leaves have an agreeably acid taste and are sometimes eaten by men as well as by animals.

The tree is a native of most parts of India, Ceylon, and Malaya, and ascends the hills to 5000 feet elevation. It is very common near villages in Bengal and often occurs spontaneously. It is easily reproduced from both cuttings and seeds, and is frequently planted to mark boundaries.

The leaves fall earlier than those of almost all other trees, and sometimes before the fruit, which then hang on the bare branches. In Bengal the flowers appear in February and March, and are followed by the new leaves in April, or sometimes later. The fruits ripen about October or November.

Hindus use the flowers in worship, especially as emblems of spring in the worship of the goddess Saraswati.

**Spondias dulcis** Forst.f. *Syn.* S. Cytherea *Sonn.*

(Dulcis is Latin meaning "sweet". Cytherea is a Greek name of the goddess Aphrodite).

| | |
|---|---|
| Bengali, | *bilati amra.* |
| Hindi, | *bilayati amra.* |
| English, | *Otaheite apple, great hog-plum, vi.* |

(F.I. p. 387. F.B.I. Vol. II. p. 42. B.P. Vol. I. p. 356.)

Leaves imparipinnate, 8 to 12 inches long; leaflets usually 13 or 15, ovate-oblong, acuminate, finely crenate or serrulate, up to 3 inches long; panicles 8 to 12 inches long; flowers polygamous, whitish; drupe ovoid, up to 3 inches long; seed 1½ inches long, ovoid, echinate.

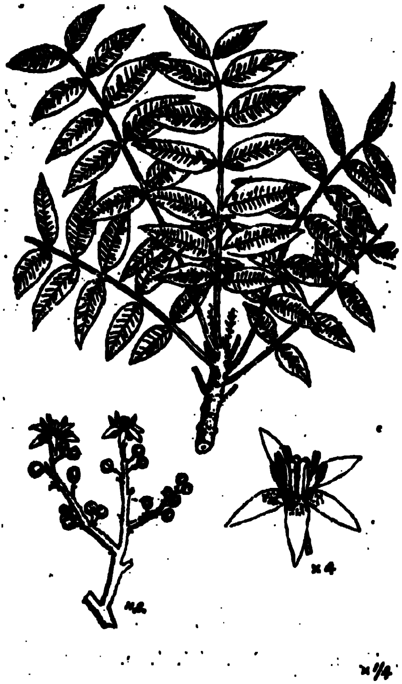
In its native country this is a tall and stately tree, but in Bengal it does not attain a large size. It has fairly smooth grey bark, stiff spreading branches, and leaves divided into two rows of rather narrow leaflets arranged in opposite pairs on either side of a midrib with a terminal leaflet at the apex. The leaflets have finely notched or toothed edges and pronounced points at their tips. The small yellowish-white flowers are of two kinds, male and bisexual, both of which grow together in rather large sprays clustered at the ends of the stiff twigs. When ripe the smooth, egg-shaped fruits are golden-yellow, often marked with russet patches; they sometimes reach a size larger than a goose's egg, and contain a big stone covered with fibre and surrounded by juicy pulp.

The rind of the fruit tastes of turpentine, but the pulp has a delicious scent like apple or quince. The flavour of the best varieties is said to be very good, but inferior fruits are acid. Nothing much can be done with the fruit as a preserve or by cooking, but in its native country it is considered to be very wholesome, and is given freely to invalids.

In Otaheite the timber is valued for making canoes.

The tree is a native of the Society Islands in the South Seas, but is now grown in many hot countries and is occasionally seen in Calcutta gardens.

The leaves fall in the cold weather and new leaves appear together with the flowers in March and April. The fruits ripen in August or September.



*SPONDIAS DULCIS*

**MANGIFERA.** (From "mango", a corruption of the Tamil name of the tree, and Latin "fero", I bear, i.e., "mango-bearer".) This is a genus comprising about 30 species of evergreen trees with undivided leaves, natives of Malaya and India, of which about 3 species are found in India. The calyx is divided into 4 or 5 segments, and the petals, which fall as the fruit develops, are also 4 or 5 in number. The stamens are as many as the petals, but only 1 or 2 are fertile. The fruit is a large fleshy berry, containing a single stone set in fibrous pulp.

**Mangifera indica** Linn.

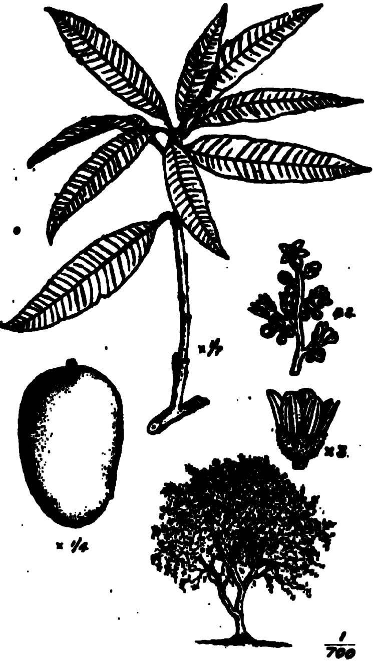
(Indica is Latin meaning "Indian".)

| | |
|---|---|
| Bengali, | *am, ambra.* |
| Hindi, | *am, amb.* |
| Urdu, | *amba.* |
| English, | *mango, spring tree, cuckoo's joy, Cupid's favourite.* |

(F.I. p. 215. F.B.I. Vol. II. p. 13. B.P. Vol. I. p. 352.)

Leaves alternate, coriaceous, oblong-lanceolate or oblong, entire, the margins often undulate, 5 to 12 inches long, crowded near the ends of the branches; petiole ½ inch to 1½ inches long; panicles large, erect, pubescent; flowers polygamous or monecious, very small, subsessile in terminal panicles; sepals and petals spreading; anthers 1 or 2 inserted on the inner side of the lobed disc; sterile stamens 2 to 4, minute; drupe 2 to 6 inches long, smooth, compressed.

The mango is a large evergreen tree with thick, rough, nearly black bark, spreading branches, and a dense crown of dark green foliage. The leathery leaves are long and narrow, usually ending in a sharp point and often with wavy edges ; they vary very greatly in size and in other respects also, but usually have a tendency to droop from their short stalks, and generally give a strong, sweet resinous smell when rubbed or broken. The young leaves may appear in small numbers at the ends of the branches at all seasons of the year ; they are usually very flaccid and for a time hang vertically downwards, while their colour is often pink or reddish. The small, yellowish, strongly scented flowers grow in great numbers in stiff, erect, open clusters at the ends of the branches. Each of the little spreading petals has three minute orange-coloured ridges on its inner face. The flowers may be unisexual or hermaphrodite, male and female, or male and hermaphrodite flowers being found mixed in the same clusters. The fruits vary greatly in shape and size, and may be yellow, green, or red when ripe, but they are always smooth-skinned, and are generally slightly flattened and elongated with a tendency to be curved at the thinner end opposite the stalk. Within there is a large, flat, pale-coloured stone more or less covered with coarse fibres, and surrounded by yellow or orange, juicy pulp, which in the better varieties has a sweet and delicious flavour.



*MANGIFERA INDICA*

Owing to its dense evergreen foliage the mango is one of the best of Indian avenue trees, and is often planted on roadsides and to form shady "topes", or groves, for ornamental reasons and as camping sites. For these purposes the common wild variety of the tree, which has small and very fibrous fruits with a strong flavour of turpentine, is grown from seed ; but the better varieties of the tree that yield good fruits can only be grown successfully from grafts.

A great number of varieties of the mango are found in different parts of India, and the fruits vary enormously in flavour as well as in all other respects, while the plants in some cases grow no higher than a man and even creep along the ground. A number of different varieties are found near Calcutta, but the climate does not seem suitable for the production of the best fruits, which are usually imported into Calcutta from Bombay and other parts of India. The best-known variety is perhaps the "Alphonse", or "afooz", which has almost round, orange-coloured fruit, and is grown principally in Bombay.

The mango is one of the most valuable fruits of India, and as well as forming an important article of diet for many Indians, is now exported in considerable quantities, either tinned or in the form of chutneys and preserves. Among the uses of the green unripe fruit it may be mentioned that it is eaten in curries, made into pickles with salt, chillies, and other ingredients, into preserves and jellies by being cooked in syrup, and into a custard with milk and sugar known as "mango-fool". The ripe fruit is cooked in curries, and the juice, dried on plates, forms thin cakes known as *"ambsath"*. The kernels of the seeds are eaten in times of scarcity, and poor people often eat them boiled with green vegetables. Unripe fruits stuffed with spices and boiled in mustard oil are considered a great delicacy. The fruits of the wild mango are an important food for many aboriginal tribes, who boil large quantities of them and drink the juice that results.

The timber is grey, and coarse-grained, hard in the case of old trees and soft in young trees. The weight is about 43 lb. per cubic foot. It is much used for cheap doors, boat-building, window-frames, packing cases, and in recent years for making plywood.

The bark and leaves yield a yellow dye, and the bark is occasionally used for tanning. Cattle are fond of the leaves and twigs.

The tree has a large number of medicinal uses ; in particular the unripe fruit is considered a cure for ophthalmia, while the ripe fruit is laxative, tonic, and good for the liver. The smoke of the burning leaves is used to stop hiccough and as a remedy for sore throat, and various parts of the tree are employed to stop bleeding. A powder made from the flowers is burned to keep away mosquitoes, and many parts of the tree are prescribed for the treatment of snake-bite and scorpion-sting. The twigs and leaves are used for cleaning the teeth, and the twigs as a substitute for *pan*.

Hindus regard mango leaves as emblems of happiness and prosperity. They are used to welcome guests and are hung in festoons over doorways and on shamianahs for festive purposes. On all religious occasions leafy twigs of the mango are kept in new pots filled with water, accompanied by a green cocoanut, and are placed one on each side of the doorway of a house along with two plantain stems. On the occasion of marriages and other happy ceremonies the leaves are used for pouring libations into the sacred fire, and the twigs with leaves or flowers are employed in the worship of Saraswati, the goddess of learning.

The tree is believed to be a native of the hotter parts of India and, although usually seen near the haunts of man, is occasionally found as if truly wild in virgin forest. It is now widely cultivated in the tropics and is very common all over Bengal.

The flowers usually appear from the end of January to March, and the fruits mostly ripen from May to July, though some varieties produce fruit at other times of the year.

## MORINGACEAE

This family contains a single genus with 3 species of soft-wooded deciduous trees, natives of the tropics of Asia and Africa, of which 2 species are found in India. The leaves are composed of many small leaflets, the midrib of the leaf being divided into branches which may be again subdivided before the leaflets are reached (bipinnate or tripinnate). The flowers are rather large, bisexual, and borne in clusters from the leaf axils; they are not symmetrical, and within the 5 unequal petals is a disc bearing 10 or 12 stamens of which 5 only are fertile. The fruit is a long, narrow, beaked pod containing numerous seeds.

The affinities of this family are very doubtful and it has been variously classified by different authorities.

**MORINGA.** (A vernacular name from Malabar). The only genus of the family.

**Moringa oleifera** Lamk. *Syn.* M. pterygosperma *Gaertn.* Hyperanthera Moringa *Willd.*

(Oleifera is Latin meaning "oil-bearing". Pterygosperma is from the Greek meaning "with winged seeds").

| | |
|---|---|
| Bengali, | *sajina, sajna, sujuna.* |
| Hindi, | *mungna, sainjna, saonjna, shajna, sondna, segva.* |
| Urdu, | *sahajna.* |
| English, | *horseradish tree, drumstick tree, ben tree.* |

(F.I. p. 360. F.B.I. Vol. II. p. 45. B.P. Vol. I. p. 357.)

A small tree; bark corky; leaves tripinnate, 12 to 30 inches long; rachis slender, thickened at the base; leaflets ½ to ¾ inch long, pale beneath, the lateral elliptic, the terminal obovate; flowers white, 1 inch diam., scented, in large puberulous panicles; sepals linear-lanceolate, reflexed; petals narrowly spatulate; stamens 5; staminodes 5; pod pendulous, 9-ribbed, 9 to 18 inches long; seeds 3-gonous, winged at the angles.

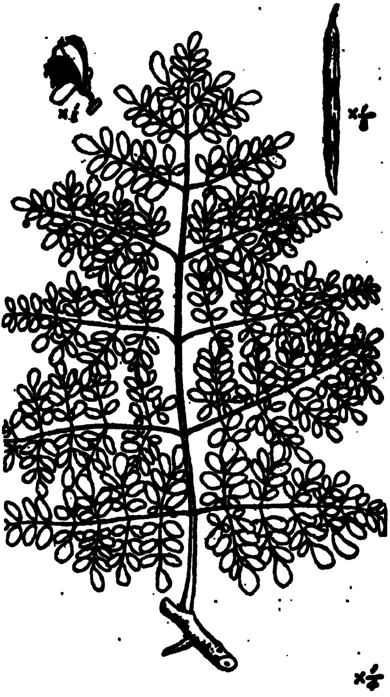
This is a small quick-growing tree with soft wood, and thick, grey, rough bark marked with longitudinal cracks. Its foliage has a light, airy, and graceful look. The large leaves are scattered along the branches, and are delicately divided into numerous small, smooth leaflets, which are bright green above and pale beneath. The slender midrib of the leaf is joined by from 4 to 8 pairs of still more slender lateral branches, each branch being opposite its pair, and each being again divided several times in the same manner until the thread-like stalks of the graceful leaflets are ultimately reached. To some people the manner in which the leaf is divided and the small leaflets are reminiscent of the fronds of a maidenhair fern. The white, scented flowers open at about the same time as the young leaves and spread in large, loose clusters from the axils of the leaves. Each flower has a calyx with 5 recurved lobes, 5 narrow, white petals, and 10 or 12 stamens, of which 5 only bear yellow anthers containing pollen. The long, slender flexible pods hang in clusters from the branches, each pod having 9 distinct ribs and rather wavy edges, and containing a number of large seeds with 3 pronounced wings.

This tree is very easily propagated not only from seed but by simply planting twigs, or even sections of large branches, in moist soil, when they will usually take root and sprout in a very short time. For this reason the tree is commonly grown in and about villages not only for its various valuable products, and as an ornament, but to support fences and to mark boundaries.

The pods, flowers, leaves, and even the twigs, are used as vegetables and cooked in many ways with various condiments. The pods are made into a curry known in Madras as "drumstick curry", and into a pickle said to be exceedingly nauseous to Europeans, but long appreciated by Indians; for it is mentioned in a list of pickles written 350 years ago. Cut into pieces about 4 inches long and boiled the same pods are said to have a flavour scarcely distinguishable from asparagus, and are only marred by their fibrous skins. The pungent root is employed in place of mustard and has long been known to Europeans as an excellent substitute for horseradish, for which purpose it is often used. The twigs and leaves are sometimes lopped for fodder, especially for camels.

The wood is soft, spongy, perishable, and useless, but a coarse fibre is obtained from the bark and is occasionally made by poor people into ropes and cordage. A dark gum exuded by the stem is used in calico-printing and sold as a substitute for gum-tragacanth. The seeds yield a clear, limpid, almost colourless oil, known as ben oil, though the true ben oil appears to come from another species *M. aptera,* a native of Africa. This oil is used by watchmakers, and is much valued by perfumers owing to its great power of absorbing and retaining delicate scents, but it seems to be seldom produced in India, though the oil from the Indian tree is said to be equal to that from the African.

The tree has a large number of medicinal uses chiefly owing to the rubefacient qualities of its various parts. The root is probably the only part of real medicinal value, for it contains an oil not unlike mustard oil, though with a more unpleasant smell, and is often used to make counter-irritant plasters and for similar purposes. The oil of the seeds is applied externally in the treatment of rheumatism, and various parts of the tree are given internally for a number of ailments. The bruised leaves are a popular remedy for the bites of snakes, dogs, monkeys, and other animals. The root is valued as a cure for sore throats, and the flowers are said to be useful in catarrhal affections.



*MORINGA OLEIFERA*

The tree is a native of the forests of the Western Himalayas, but is now cultivated in many tropical countries including most parts of India. It is very common near Calcutta, but is seldom seen in the town itself.

The flowers appear with the young leaves from the end of

January to the beginning of April, and the pods ripen about three months later. The tree remains bare of leaves for several months in the cold season.

## LEGUMINOSAE

(From the Latin "legumen", a bean).

This is the second largest family of flowering plants, comprising about 500 genera with 12,000 species of herbs, shrubs, and trees. The leaves are very various in form but are usually not arranged in opposite pairs, and are commonly divided into a number of separate leaflets; they are generally accompanied by stipules (small leafy attachments to the stem near the base of each leaf). The calyx is divided into 5 segments while the petals are normally 5 in number, and are often unequal, making the flowers unsymmetrical. The stamens generally number 10, and the fruit consists of a single pod generally containing several seeds and usually splitting open along one or two sutures into two valves.

The family is divided into 3 very easily distinguishable sub-families, chiefly according to the form of the flowers, as follows:—

1. *Papilionaceae.* This sub-family has flowers shaped like those of a pea, i.e., with 5 petals of which the uppermost is broad and often bent backwards, the two lowest are more or less joined together to form a beak or keel, and the two lateral enclose the two lower; the stamens are usually more or less joined into a sheath which encloses the style.
2. *Caesalpineae.* The flowers of this sub-family are usually large and showy. The 5 petals are unequal, but are all quite separate and overlap only slightly; the stamens are also quite separate.
3. *Mimoseae.* This sub-family has small flowers of which many are usually densely clustered in compact heads or spikes. The petals are equal and more or less joined together. The stamens may be separate or joined; they are sometimes very numerous and often project far beyond the petals, forming the most conspicuous part of the flower.

The roots of most leguminous plants bear small nodules containing bacteria which enable the plants to take up much more nitrogen from the air than other plants. Hence by increasing the available nitrogen, these plants tend to enrich rather than impoverish the soil in which they grow; many of them are therefore of great importance in the rotation of crops, and for the same reason trees of this family are usually chosen when "shade trees" are required, in tea gardens and elsewhere, to give protection to delicate plants beneath them.

The family includes some of the most important of India's food crops, a number of valuable timber trees, and many of the most beautiful flowering trees and shrubs to be found in the world.

1. *Papilionaceae.* (From the Latin "papilio", a butterfly, in allusion to the shape of the flowers). This division of the family *Leguminosae* comprises herbs, shrubs, and trees from all parts of the world, and includes all the leguminous plants which are found in cold countries. The flowers are formed more or less after the manner of the typical pea-flower, i.e., the two lower petals are joined to form a "keel", the two lateral petals overlap and enclose the keel, and the upper petal is broader than the others, encloses them all in bud, and is often bent back when the flowers open. The calyx is divided into 5 segments, which often form two lips, the upper lip with 2 segments, and the lower with 3. The stamens are usually 10 in number, and are more or less joined into a sheath which encloses the ovary and style; the sheath is split along its upper side and often along the lower side to form two half sheaths of 5 segments each; sometimes 9 stamens form a sheath while the tenth

is separate. The classification of the species is largely based on the arrangements of the stamens.

The flowers of these plants are elaborately adapted to secure cross-fertilisation of one flower by another by making use of the higher and more intelligent insects, such as bees. The insects alight on the two lateral petals and probe for honey near the base of the broad upper petal. The side petals are usually connected in some way to the two lower petals which enclose the stamens and style, so that the latter are forced outwards and may be touched by the insects. Different species have various mechanisms whereby pollen is squeezed, or thrown, out onto the insect; usually the stigma first emerges to be rubbed by the insect, and pollen is released later, so that it may be carried on and applied to the stigma of the next flower to be visited, thus ensuring as far as possible that each flower is pollinated by the pollen of another flower and not by its own, and so effecting cross-fertilisation.

The *Papilionaceae* are a most important group of plants, for they include all the peas, beans and pulses (*dal*) which form such valuable food for men and animals, as well as many other trees and herbs which yield timber, edible roots, fibres, fodder, pith, and various other products. Also included in this family are many beautiful garden plants such as the sweet pea (*Lathyrus odoratus* Linn). A large number of species of herbs and climbers of this sub-family are wild and cultivated in Bengal.

On the western edge of Chowringhee, near its junction with Theatre Road, there is a single specimen of *Myroxylon Pereirae* Klotsch, the Balsam of Peru, a native of San Salvador. This is a beautiful, lofty evergreen tree, with smooth, grey bark and shining leaves about 9 inches long, divided into about 8 leaflets alternately arranged on either side of a central midrib. Each leaflet has a short blunt point with a small notch at the apex and its edges are wavy. The small whitish flowers are seldom, if ever, seen in the climate of Bengal. The genus is closely allied to *Castanospermum*, from which it differs in its pod, which does not split open to release the seed, and is narrow and winged at the base. Its name is from the Greek, meaning "myrrh wood." A medicinal balsam can be obtained from incisions in the bark. This is one of the most handsome foliage trees to be found in Bengal and is worthy of further cultivation.

**SESBANIA.** (An Arabic plant name). A genus of about 20 species of herbs and short-lived trees, natives of the tropics and subtropics. The leaves are divided into many small leaflets arranged in opposite pairs on either side of a central midrib with no terminal leaflet at the tip (paripinnate). The flowers are large, and the stamens consist of 9 joined in a sheath and 1 separate (diadelphous). The pods are long and narrow, and are divided by partitions between the numerous seeds (septate).

This genus includes *S. cannabina* Pers. (Bengali, *dhunchi*) a common field crop in Bengal, as well as several weeds common in marshes and wet places near Calcutta.

**Sesbania grandiflora** Pers. *Syn.* Aeschynomene grandiflora *Roxb.*

(Grandiflora is Latin meaning "with large flowers").

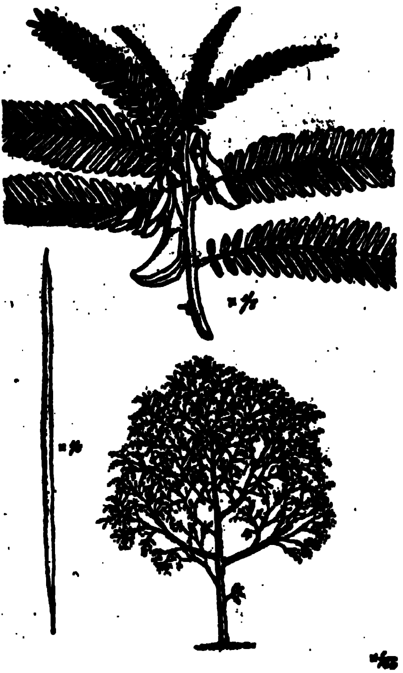
| | |
|---|---|
| Bengali, | *agati, agasthi, agusta, bakphul, bagphal, bak, buka.* |
| Hindi, | *agasti, agust, bak, basta, hatiya, basna.* |
| Urdu, | *agust.* |
| English, | *swamp pea.* |

(F.I. p. 569. F.B.I. Vol. II. p. 115. B.P. Vol. I. p. 404.)

A small tree; leaves paripinnate, ½ to 1 foot long; leaflets 20 to 60, about 1 inch long, oblong, glabrous; flowers 2 to 4, in short, axillary racemes, 3 to 4 inches long, white, red, or pink; pod 1 foot or more long, falcate, firm, septate, tetragonous, the sutures thickened.

This is a pretty little soft-wooded tree with smooth, light brown bark, a straight stem, spreading branches, and slender leaves divided into two rows of small, narrow, bright green leaflets. Its very large flowers grow in small clusters in the axils of the leaves; their petals are arranged like those of a pea-flower, according to the usual plan in this sub-family, but in this case they take a very elongated form; occasionally "double" varieties are found in which the flowers have more than five petals and are much contorted. The flowers may be white, crimson or various shades of pink. The pods are very long and slender, four-angled, slightly curved, and contain numerous seeds; they mostly ripen in May and June, when they are yellowish in colour.

The young leaves, pods, and flowers of this tree are eaten as vegetables and in curries, and are also given to cattle as fodder. The timber is white, soft and not durable, weighing only about 32 lb. per cubic foot, but it is used for posts to support the roofs of huts, and as firewood. The tree is often grown as a support for the betel vine.



*SESBANIA GRANDIFLORA*

The bark is very astringent and is used as a tonic and in the early stages of smallpox. The juice of the leaves and flowers is a popular remedy in Bombay for catarrh and headache, and a poultice made from the leaves is applied to bruises. The root of the red-flowered variety, rubbed into a paste with water, is considered a valuable application in rheumatism, while the bark of the white-flowered variety is said to be given internally in cases of snake-bite.

The flowers are sacred to the god Shiva. They are specially valued as offerings in the month of Kartik.

The tree is a native of Malaya. It is now grown in many parts of India, and is common in villages near Calcutta. Its growth is very rapid and the plant may reach a height of 20 feet within two years of sowing.

The flowers appear mostly from September to November, but continue through the cold season well into the hot weather.

**Sesbania Sesban** (L.) Merr. *Syn.* S. aegyptiaca *Pers.* Aeschynomene Sesban *Linn.*

(Aegyptiaca means "from Egypt". Sesban is an Arabic name).

| | |
|---|---|
| Bengali, | *jayanti.* |
| Hindi, | *jaint, jait, janjhan, jet, jhijam, rasin, dhandiain.* |
| Urdu, | *jait.* |

(F.I. p. 569. F.B.I. Vol. II. p. 114. B.P. Vol. I. p. 403.)

A small, soft-wooded, short-lived tree or shrub; leaves paripinnate, up to 6 inches long; leaflets 18 to 40, opposite, linear-oblong, obtuse, puberulous when young, minutely petiolulate, up to 1 inch long; flowers up to 2/3 inch long, yellow, red, or purplish, in lax few-flowered axillary racemes; pedicels up to 4 inches long; bracts lanceolate, scarious; calyx campanulate, ¼ inch long; standard orbicular; stamens diadelphous; pods up to 9 inches long, pendulous, twisted, sharply beaked; seeds 20 to 30.

This is a quick growing shrub or a small, straight, short-lived tree, with pale brownish grey bark, and greyish-green foliage. The leaves are divided into a number of small, narrow, blunt leaflets, which are set in opposite pairs on either side of the midrib of the leaf. The yellow or red flowers grow in small clusters on rather long, drooping stalks, which spring from the bases of the leaves. Each flower is shaped like the flower of a pea, and has its upper petal broad and almost round. Of the ten stamens, nine are joined to form a tube round the ovary, the tube being split down one side, and the tenth stamen separate from the others and situated in the opening between the two sides of the tube. The pods are long, slender and pendulous, and contain a number of seeds, each of which is separated from its neighbours by partitions in the pod.

The flowers are usually marked with red, especially on the large upper petal, but a variety with pure yellow flowers is found and has been called *var. typica*. Another variety with the large upper petals dark maroon on the outside, and the two lower petals tipped with red, has been called *var. bicolor* W. & A. A form with the upper petal dotted with purple, but otherwise with pure yellow petals, is known as *var. picta* Prain. A variety with entirely chocolate-coloured or maroon flowers also occurs occasionally. All parts of the plant vary greatly in regard to size.

This plant is often used to make hedges, and is frequently grown from seed as an annual to form a barrier round field crops. It is also found in gardens, where it is used to give shade to young plants, and to support creepers, and is clipped to form ornamental hedges. If left to grow without pruning, it sometimes attains a height of as much as twenty feet, and this within one year.

The wood is very soft, white, and fibrous, weighing about 27 lb. per cubic foot. It was formerly used to make gunpowder charcoal, and it is planted in dry districts to yield a substitute for bamboos. In Assam the stems are split and plaited into mats, and in Burma the wood is made into toys. The bark is made in ropes, and the leaves and branches form excellent fodder for cattle.

*SESBANIA SESBAN*

The plant has a number of medicinal uses. The seeds are stimulating and astringent, and are regarded as a remedy for diarrhoea and diseases of the spleen, as well as for ulcers and skin diseases. The leaves are made into poultices for the treatment of wounds and swellings. The root is believed to be a remedy for scorpion-stings, and there is a superstition that the mere sight of the seeds of the tree will remove the pain of these stings.

This plant is wild in tropical Africa, and is cultivated in all hot countries. It is very common in Bengal, and may be seen in Calcutta gardens.

The flowers appear principally in the cold season but also during the rains. The plants only live about three years.

Hindus use the leaves and flowers in worship on the occasion of the Durga puja.

**MILLETTIA.** (Named after C. Millett, an officer of the East India Company, circa 1820). This is a genus of about 60 species of trees and climbing plants, natives of the tropics and subtropics of Asia and Africa, of which about 10 species are found in India. The leaves are divided into 2 rows of leaflets arranged in opposite pairs with a terminal leaflet at the end of the midrib (imparipinnate). The flowers have the typical structure of the sub-family (i.e. like the flower of a pea) and are white, pink, or occasionally blue. The calyx-lobes are very short or altogether absent, but the petals are attached by narrow ribbons (claws). Nine stamens are joined into a sheath while the tenth is separate (diadelphous). The pods are woody or firm, and split open by 2 valves.

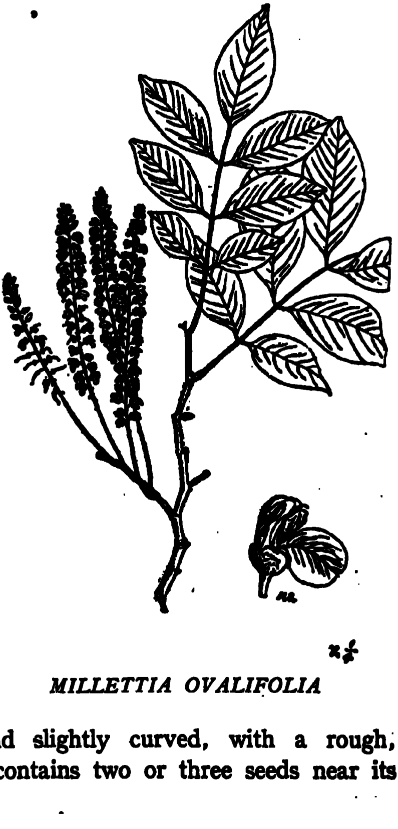
**Millettia ovalifolia** Kurz.

(Ovalifolia means "having oval leaves").

(F.B.I. Vol. II. p. 107. Not in F.I. & B.P.)

Leaves imparipinnate ; leaflets 7, elliptic-ovate, chartaceous, glabrous, up to 2 inches long ; petiolules 1/8 to 1/6 inch long ; flowers in drooping axillary racemes ; calyx glabrous, dark red or purplish, broader than long ; corolla purple or mauve, about ½ inch long ; pod 2- or 3-seeded near middle, pale, incurved, narrowed to base, verrucose, 2 to 3 inches long.

This is a very beautiful little tree with a rounded crown and branches that have a tendency to droop. The smooth grey bark flakes off the trunk in small irregular pieces. Most of the leaves fall in the cold season and many of the branches remain bare for a short time, until in the early hot season they become covered with drooping sprays of small lilac or bright mauve flowers. The new leaves follow soon after the flowers ; each leaf is divided into seven thin, smooth, pointed, bright-green leaflets arranged in three opposite pairs on either side of a slender midrib with a terminal leaflet at the tip. The pods are pale in colour, flat and slightly curved, with a rough, knobbly surface ; each pod contains two or three seeds near its centre.



*MILLETTIA OVALIFOLIA*

This tree is a native of the Prome district of Burma. It is not uncommon in Calcutta gardens, and is one of the most beautiful of trees when covered with its delicate sprays of flowers before the leaves appear. Later in the year its neat dwarf habit and elegant foliage make it a very desirable garden tree.

A fine specimen may be seen on the west side of Dalhousie Square (1944).

**GLIRICIDIA.** (From the Latin "glis", a dormouse, and "caedere", to kill, in allusion to the fact that the seeds are used for poisoning rodents). This is a genus of about 10 species of trees and shrubs, natives of tropical America. The leaves are divided into two rows of leaflets arranged in opposite pairs with a terminal leaflet at the tip of the midrib (imparipinnate). The flowers are shaped like those of a pea and are white or pink in colour. Nine of the stamens are joined to form a sheath while the tenth is separate (diadelphous). The pod is many-sided, flat and wingless, and opens into two leathery valves (dehiscent).

**Gliricidia maculata** H.B.K.

(Maculata is Latin meaning "spotted", probably in allusion to the whitish spots on the bark of the young branches).

English, *madre tree, mother of cocoa, Madura shade tree.*

(Not in F.I., F.B.I. & B.P.)

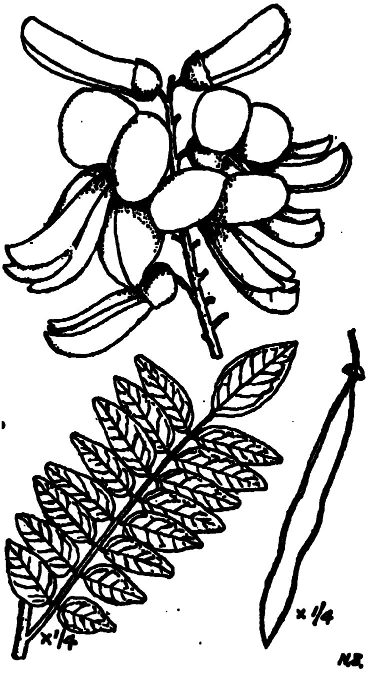
Leaves imparipinnate, up to 12 inches long; leaflets 9 to 19, opposite, elliptic, obtuse, oblique, minutely puberulous, pale below; racemes up to 4 inches long; calyx tubular, almost entire, reddish, about ¼ inch long; corolla white or pink, standard with a pale yellow mark in centre below; stamens diadelphous; pod flat, up to 8 inches by ¾ inch; seeds up to 10 or more.

This small tree has a short trunk covered with soft grey bark marked by longitudinal cracks, and long, straight, slender branches which at first tend to rise almost vertically from the base. The bark of the young branches is a warm brownish-grey and is sprinkled with whitish spots. The graceful leaves are divided into a number of thin, broad, pointed leaflets, which are bright green above and pale below, and are arranged in opposite pairs on either side of a slender midrib with a terminal and still broader leaflet at the tip. In the cold season most of the leaves fall and the branches remain bare until in February the small white, pink, or pale mauve flowers appear in small sprays which literally cover the greater part of the branches. The flowers are shaped like the typical pea-flower and have a pale yellow mark near the base of the upper petal, which is a guide to the position of the honey for visiting insects. The new leaves closely follow the flowers in March and April. The pods are long and flat containing several seeds; they are usually borne rather sparsely in the climate of Bengal.

The tree is very quick-growing and bears pruning well; in gardens it is usually "pollarded", i.e. all the branches are cut off at the top of the trunk and young branches are allowed to take their place. If allowed to grow without pruning it soon becomes very straggling and untidy.

The tree has great beauty when in full flower, but at other times of the year seems rather ungraceful owing to the numerous straight, slender, stiff branches that radiate upwards from the top of the short pollarded trunk.

The tree is used in several parts of India as a shade tree for crops, for which purpose it is very suitable owing to the ease with which it is propagated by cuttings, and the speed with which it will form a shady spreading crown after the trunk has been lopped a few feet from the ground. The whole tree is very rich in nitrogen and the loppings are often used as green manure. In South America it is much planted as a shade tree for the cocoa plant.



*GLIRICIDIA MACULATA*

The dried leaves smell like new-mown hay.

This tree is a native of tropical America. It is now cultivated in many tropical countries and is common in Calcutta gardens.

**PISCIDIA.** (From the Latin "piscis", a fish, and "caedere", to kill, in allusion to the use of the seeds for stupefying fish). This is a genus of two species of trees, natives of tropical America. The leaves are divided into two rows of leaflets arranged in pairs on opposite sides of the midrib with a terminal leaflet at the tip (imparipinnate). The flower is shaped like a pea-flower, and is unusual in that nine stamens are joined to form a sheath round the style, while the tenth is separate at the base but is joined to the tube higher up. The pod is short and thickish, and has four wings.

**Piscidia Erythrina** Linn.

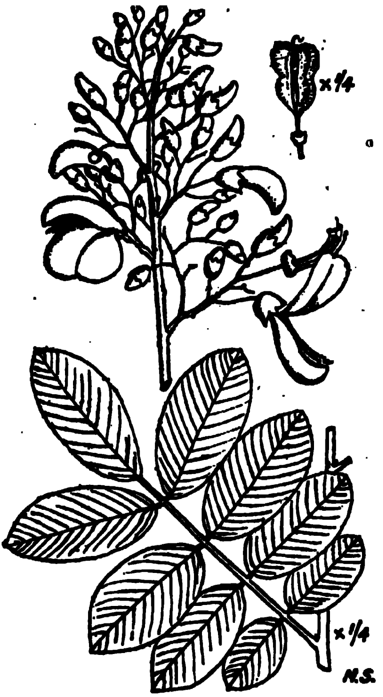
(Erythrina is the name of a genus of plants of this sub-family with red flowers).

English, *fish-poison tree, Jamaica dog-wood.*

(Not in F.I., F.B. & B.P.)

Leaves imparipinnate, up to 9 inches long; leaflets 7 to 11, opposite, oblong or elliptic, glabrous, up to 2½ inches long, the terminal largest; panicles up to 6 inches long, scattered along the branches; calyx puberulous, purplish, 5-toothed; corolla ½ inch across, pale mauve with pale yellow mark at base of standard; stamens monadelphous, the tenth free below and curved outward in a loop; pod 2 to 4 inches long by 1/3 inch wide, longitudinally 4-winged and irregularly jointed; seeds 6 to 8, black.

This is a small tree with grey bark which flakes off in irregular pieces, and a rather straggling habit of growth. Its leaves are divided into a number of dark green, rather narrow leaflets arranged in opposite pairs on either side of the midrib with a terminal and rather larger leaflet at the tip. The mauve flowers grow in scattered clusters along the branches, each flower shaped like the typical flower of a pea, with a pale yellow mark at the base of the broad upper petal as a guide to the position of the honey for the benefit of visiting insects. The pods are narrow and rather thick with four wings at the corners.



*PISCIDIA ERYTHRINA*

The seeds of this tree are poisonous and are used in the West Indies for stupefying fish before catching them. When given in less than lethal doses to the higher animals they are said to have a hypnotic effect, and they have been used medicinally for this purpose.

The tree is a native of Jamaica and other places in tropical America. It is not to be highly recommended as an ornamental tree because its flowers are neither graceful nor of a striking colour, but it is occasionally grown in Indian gardens. A tree may be seen near the north-west corner of the Calcutta Zoological Gardens and another (in 1944) on the east side of Dalhousie Square. When the branches are bare of leaves in March and April, they are sometimes almost covered by the clusters of pale mauve flowers. The new leaves are produced soon after the flowers open.

**PONGAMIA.** (From the Tamil name of the tree, "ponga", or "pongam"). This is a genus containing one species only, a tree which is found on the banks of streams and ditches throughout the plains of India, and is often planted as a shade tree. The leaves are divided into two rows of leaflets set in opposite pairs on either side of the midrib with a terminal leaflet at the tip (imparipinnate). The flowers are white or purple, with 10 stamens joined into a sheath, the tenth stamen being separate near its base. The pod is woody and thick, has no wings, and contains one seed. The genus differs from *Piscidia* chiefly in the shape of the pods.

**Pongamia pinnata** (Linn.) Merr. *Syn*. P. glabra *Vent*. Galedupa indica *Lam*.

(Glabra is Latin meaning "hairless". Pinnata is Latin meaning "feathered", in allusion to the leaflets. Indica means "Indian").

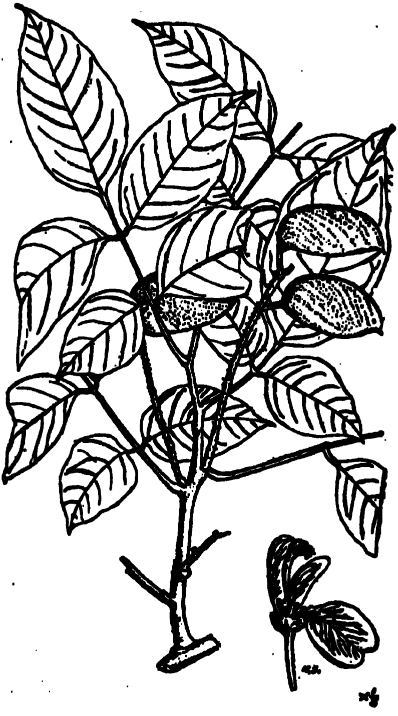
| | |
|---|---|
| Bengali, | *karanja, dahur karanja, dalkaramcha, karmuj, khawari.* |
| Hindi, | *karanj, papar, kiramal, kanja.* |
| English, | *Indian beech, poonga oil plant.* |

(F.I. p. 538. F.B.I. Vol. II. p. 240. B.P. Vol. I. p. 407.)

Leaves imparipinnate, 8 to 14 inches long, glabrous, bright green; leaflets 5 or 7, opposite, ovate or elliptic, shortly acuminate, 2 to 5 inches long; flowers 2-4-nate in simple, long-peduncled, axillary racemes; corolla purple or whitish, ½ inch long; standard silky on the back; pod woody, glabrous, more or less falcate, 1-seeded, 1½ to 2 inches long, up to ¼ inch thick.

This is a moderate-sized spreading tree with soft, smooth, greyish-brown bark, usually covered with small knobs or swellings, a short bole, and a rounded crown. The bright green, shining leaves are divided into several leaflets arranged in opposite pairs on either side of a slender midrib with a terminal leaflet at the tip. The foliage is nearly evergreen, but it mostly falls in the early hot weather and is at once replaced by fresh green leaves. In May and June the lilac-coloured, or pale pink flowers are borne in great profusion in short clusters growing on long stalks from the axils of the leaves. Each flower is shaped like the flower of a pea. The short, broad pods are woody in texture and contain a single seed; they take nearly a full year to ripen and do not fall till the hot weather of the year after their origin. They do not split open and the seed cannot germinate until the walls of the pod decay. As the trees in their wild state usually grow near water, the form of the fruit is doubtless adapted to help the distribution of the seed by its ability to float long distances in streams.

The seeds yield an oil which was once widely used for illuminating purposes but has now been largely superseded by kerosene. The ash of the wood is sometimes used for dyeing, and a coarse fibre is obtained from the bark. The fruit is said to be eaten by men, and the leaves make good fodder for cattle. In the south of India the leaves are extensively employed for manuring rice-fields, for which purpose they appear to have some special merit which is not fully understood.



*PONGAMIA PINNATA*

The wood is white, fairly hard, tough, coarse, and not easy to work ; its weight is about 40 lb. per cubic foot when seasoned. It is used for making solid cartwheels and for fuel.

The tree has a number of medicinal uses. In particular the oil from the seeds is employed to cure skin diseases. In Ceylon the juice of the roots is used for sores and also for cleaning the teeth. The leaves as well as the oil from the seeds are considered useful in the treatment of rheumatism.

The tree is wild and common all over China, Malaya, tropical Australia and Ceylon, as well as in most parts of India. Its home is the sea-shore and near water, but it will grow in dry places also, and it is now a favourite shade tree in many of the dryer districts of India, where it is often planted on roadsides. In Bengal it is often seen on the edge of tanks and ditches with its branches overhanging the water. It is also grown in gardens, where the delicate greens of its foliage and its profuse flowers make it worthy of a place, especially on lawns, because grass grows well in its shade. It is readily propagated and boughs stuck in damp ground soon take root.

**PTEROCARPUS.** (From the Greek "pteron", a wing, and "karpos", a fruit, in allusion to the winged pods). This is a genus of about 15 species of large trees, natives of the tropics of the Old and New Worlds, of which 3 species are found in India. The leaves are divided into separate leaflets, of a leathery texture, arranged in two rows on either side of a slender midrib with a terminal leaflet as the tip (imparipinnate). The lateral leaflets are not placed in opposite pairs. The flowers are yellow, usually rather large, and shaped like the typical flower of a pea. The pods are flat and usually more or less circular with a broad wing surrounding the thicker centre.

The genus contains several valuable timber trees including *P. dalbergioides* Roxb., the Andaman redwood, an immense tree of great importance in the Andamans, and *P. macrocarpus* Kurz, a common tree of the inland parts of Burma.

**Pterocarpus indicus** Willd.

(Indicus means "of India").

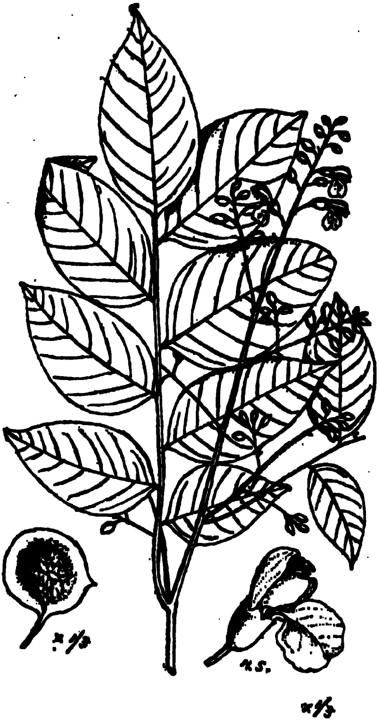
English, *padauk* (this is the Burmese name which is also applied to *P. macrocarpus* and to *P. dalbergioides*), *Burmese rosewood, senna tree, gold mohur* (this is the name given to this tree in Singapore; in India it is usually given to *Delonix regia* Raf.)

(F.I. p. 538. F.B.I. Vol. II. p. 238. B.P. p. 412.)

Leaves imparipinnate, 6 to 9 inches long; leaflets alternate, 5 to 9, elliptic, abruptly acuminate with an obtuse point, glabrous, subcoriaceous, 2 to 4 inches long; flowers in terminal panicles, numerous, orange-yellow, fragrant, about ½ inch long; calyx 1/5 to ¼ inch long, brown-silky, teeth rounded; standard ⅜ to ½ inch broad; pod orbicular, 1 to 2 inches diam., silky pubescent when young, the wing ⅓ to ½ inch broad.

This is a handsome, lofty, evergreen tree with olive-grey bark, a rounded spreading head, drooping branches, and rather small leaves divided into a number of dark green, shining leaflets arranged on either side of a central midrib with a terminal, and somewhat larger, leaflet at the tip; the leaflets are rather narrow in outline, ending in a blunt point, and the lateral leaflets are not set in opposite pairs. The golden yellow, sweet-scented flowers grow in open clusters at the ends of the branches, each flower being shaped like the flower of a pea. The pods are flat and round with a broad wing which enables the whole pod to be carried by the wind from the top of the tree to a distant point, thus ensuring the dispersal of the seed over a wide area.

The tree is believed to be indigenous in Malaya and is often planted in Burma. In India it is grown in gardens for its flowers and for its handsome foliage, and it is not uncommon in Calcutta. Two fine specimens may be seen in the Victoria Memorial garden, and others in the Zoological Gardens. The flowers are said to be produced three times during each hot season before the break of the rains, and this has been found to be more or less true of



*PTEROCARPUS INDICUS*

the trees in Calcutta. The orange-yellow flowers form a fine contrast to the dark shining green of the leaves, but unfortunately they are usually borne too high from the ground to be clearly seen. They are very short-lived and all the trees in the same neighbourhood are said to flower on the same days. The fresh young leaves mostly appear at intervals during the rains, when the trees are sometimes a brilliant emerald green, very different from their usual dark colour.

The wood is hard and of fine quality, though less useful than that of *P. dalbergioides*, the Andaman redwood, or Andaman padauk, with which this tree is often confused. The heartwood is dark brick-red, and its weight is about 60 lb. per cubic foot. It is much used for building, and for making cartwheels, furniture, and musical instruments.

The kernel of the seed is used as an emetic, and an infusion of the leaves is given in fevers.

**DALBERGIA.** (Named after Nicholas Dalberg, a Swedish botanist who died in 1820). This is a genus of about 80 species of trees, shrubs and climbers, natives of the tropics and sub-tropics. The leaves are divided into two rows of leaflets, which are set on either side of a slender midrib but not in opposite pairs (pinnate with alternate leaflets). The flowers are small, set in branching clusters, and white or purplish in colour. The pods are flat but they do not open into separate valves in order to release the seeds (indehiscent).

The genus includes about 25 species found in India, including two of the most valuable of Indian timber trees. No species is wild near Calcutta but three are planted in and about the city.

**Dalbergia Sissoo** Roxb.

(Sissoo is an Indian vernacular name).

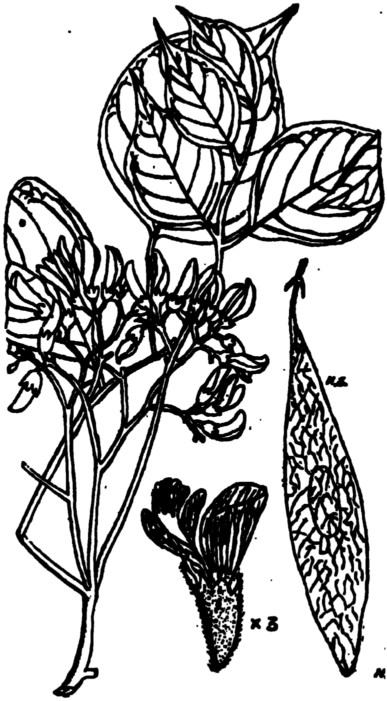
| | |
|---|---|
| Bengali, | *sisu.* |
| Hindi, | *shisham, sissu, sissai, tali.* |
| English, | *sissoo, South Indian redwood.* |

(F.I. p. 533. F.B.I. Vol. II. p. 231. B.P. Vol. I. p. 411.)

Leaves imparipinnate; leaflets 3 to 5, alternate, broadly-elliptic or ovate, acuminate, pubescent when young, glabrous when mature, 1 to 3 inches long; leaf rachis zig-zag; flowers yellowish-white, ¼ inch long, in short axillary panicles; stamens 9, monadelphous; pod linear-lanceolate, 1½ to 4 inches long, 1 to 4 seeded.

The sissoo is a large tree with rough grey bark which peels off in narrow longitudinal stripes. Its leaves are divided into several rather small, roundish leaflets with pronounced points, which are set on either side of a zig-zag midrib, not in opposite pairs but alternately, and with a terminal leaflet larger than the others at the end of the midrib. The small yellowish-white, scented flowers, each shaped after the plan of a pea-flower, grow in short branching clusters from the axils of the leaves. In this species the stamens are nine in number and are joined to form a tube which is slit along its upper side. The fruit is a thin, strap-shaped pod, pale brown when ripe, containing a few flattened seeds.

The pods do not burst open when ripe to free the seeds, but are scattered by wind and water; the thin outer covering of the pod soon decays and the seeds then germinate. In their wild state the trees are usually found growing on the banks of streams and rivers to which their pods have been carried by floods.



*DALBERGIA SISSOO*

The sissoo is one of the most important of Indian timber trees, and has perhaps been planted to a greater extent than any other tree except teak. The wood is very hard and close-grained, weighing about 48 lb. per cubic foot. It is durable, seasons well, and does not warp or split. It is extensively used for furniture, boat-building and for construction generally, and is said to be the finest of Indian timbers for carving.

An oil obtained from the seeds is used to cure skin diseases. The powdered wood is considered valuable in leprosy and skin eruptions.

The sissoo is a native of the outer hills of the Himalayas, but is now found throughout India. It is very commonly grown not only in plantations but as an avenue tree, though owing to its light shade it is perhaps less suitable for this purpose than many others. It is not indigenous near Calcutta but is often planted there on roadsides, and a number of specimens may be seen on the Maidan.

The leaves fall in the cold season and are replaced in January and February by new foliage, which is closely followed by the flowers. The pods ripen from November to January. The flowers are very fragrant, and their scent carries far on the evening air.

**Dalbergia latifolia** Roxb.

(Latifolia is Latin meaning "with broad leaves").

| | |
|---|---|
| Bengali, | *sitsal.* |
| Hindi, | *bilayati shisham.* |
| English, | *Indian rosewood, dark blackwood, blackwood.* |

(F.I. p. 532. F.B.I. Vol. II. p. 231. B.P. Vol. I. p. 411.)

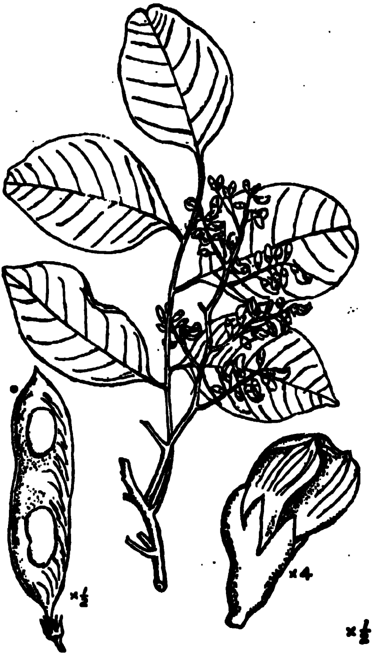
Leaves imparipinnate, glabrous, 4 to 6 inches long; leaflets alternate, 3 to 7, broadly elliptic or orbicular, obtuse, sometimes emarginate, ⅓ to 3 inches long; rachis straight; petiolules long; flower in short axillary panicles, whitish, ¼ inch long; stamens 9, monadelphous; pod firm, oblong-lanceolate, 1- to 4-seeded.

This is a deciduous tree with grey bark which is marked with short irregular cracks and peels off in thin longitudinal flakes. In the south of India, which is its real home, the tree grows tall and straight, but in the north it usually assumes the form of a low, branching tree with a curved hole. Its leaves are divided into several roundish leaflets with blunt ends, which are arranged on either side of a slender, straight midrib with a terminal leaflet at the tip. The lateral leaflets are not placed in opposite pairs but alternately. The small whitish flowers, each shaped like a diminutive pea-flower, grow in short branching clusters among the leaves. The pods are flat, firm and strap-shaped, and brown in colour when ripe.

This tree yields one of the most valuable of Indian timbers, which is much used for making furniture, and similar purposes; the fine old carved chairs, sideboards, etc., made from this wood are well known, but apparently fewer are made now than formerly. The wood is extremely hard and close-grained but easily worked. The weight is about 50 lb. per cubic foot. It is purple-black in colour and takes a high polish.

The tree is indigenous in the outer ranges of the Himalayas and in Central and Southern India. It is said to be occasionally planted near Calcutta.

The flowers usually appear in April or August, and the new leaves in the hot weather. It forms a more satisfactory shade tree than *Dalbergia Sissoo* owing to its denser foliage.



*DALBERGIA LATIFOLIA*

**Dalbergia lanceolaria** Linn. *Syn.* D. frondosa *Roxb.*

(Lanceolaria means "lancet-like", presumably with reference to the shape of the pod. Frondosa means "leafy").

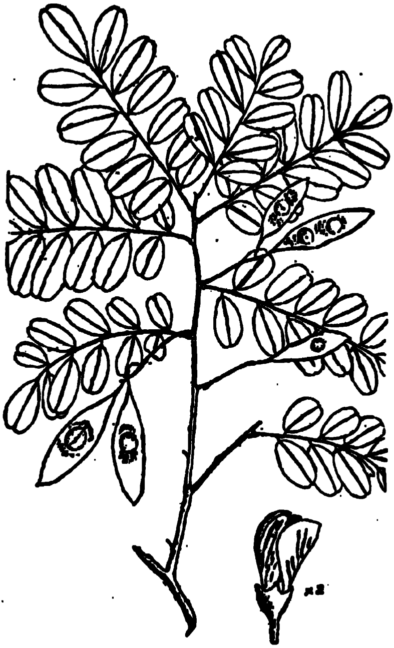
| | |
|---|---|
| Bengali, | *chakemdia.* |
| Hindi, | *takoli, bithua.* |

(F.I. p. 534. F.B.I. Vol. II. p. 235. B.P.Vol. I. p. 411.)

Leaves alternate, imparipinnate, glabrous, 3 to 8 inches long; leaflets 9 to 17, alternate, ovate or obovate, obtuse, often emarginate, 1 to 2 inches long; flowers in short unilateral racemes arranged in large terminal and axillary panicles; calyx 5-toothed, ⅛ inch long, brownish purple; corolla pale mauve, ¼ to ⅓ inch long; pod narrowed to the point and base, 1- to 3-seeded, 1½ to 4 inches long, light brown, flexible.

This tall and graceful deciduous tree has slender, rather drooping branches, and smooth grey bark which peels off in rounded patches. Its leaves are delicately divided into a number of thin, bright green leaflets set on either side of a slender, straight midrib, with a terminal, and usually slightly larger, leaflet at the tip; each leaflet is narrowed at the base to a short stalk, and is broadly rounded at the tip, usually with a pronounced notch in the centre at the end of its central nerve. The small, pale mauve or lavender flowers grow in great profusion in little one-sided spikes which are arranged in large, widely-branching clusters at the ends of the twigs and among the leaves. The pods are brown when ripe, flat and pointed, and narrowed at the base into a long stalk; they contain from one to three seeds, the number being clearly visible from the outside of the pod.

The tree sheds its foliage in the spring and produces its new leaves along with the flowers, usually in May. It is a graceful tree at all times, and has a delicate beauty during the short period when the flowers are mingled with the fresh new leaves.



*DALBERGIA LANCEOLARIA*

The wood is white and fairly hard, without heartwood, and not durable. It seems to be very variable in weight and quality. It is said to be used in Bombay for the handles of tools and agricultural implements, and elsewhere for building purposes.

An oil obtained from the seeds is considered a remedy for rheumatic affections. The bark is given in infusion to relieve dyspepsia, and as an external application in cases of remittent fever.

The tree is a native of the Sikkim Terai, Bihar, and the Western Peninsular of India. It is occasionally planted in Calcutta and on roadsides nearby. A specimen may be seen (in 1941) on the west side of Kidderpore Road north of its junction with the Red Road, and others grow in the Calcutta Zoo.

**ERYTHRINA.** (From the Greek "eruthros", red, in allusion to the colour of the flowers). This is a genus of about 30 species of soft-wooded trees and shrubs, natives of the tropics and sub-tropics of both hemispheres, of which about 6 species are indigenous in India. The leaves are divided into three leaflets (trifoliolate), and the flowers are large and usually red, the upper petal greatly exceeding the others. The 10 stamens are joined into a single sheath (monadelphous). The pod is very narrow and swollen with joints between each seed.

In addition to the small indigenous trees described below, a number of shrubs of this genus are grown in Indian gardens, some of which are very ornamental. The best known of these is probably *E. Crista-galli* Linn., the cock's-comb, with large erect clusters of crimson flowers. *E. Parcelli* has variegated foliage and orange flowers.

**Erythrina indica** Lam. *Syn.* E. variegata *Linn.*

(Indica means "of India".)

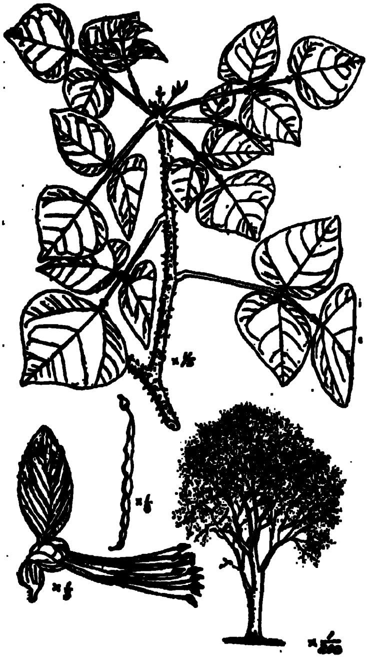
| | |
|---|---|
| Bengali, | *palita mandar, paltemadar, rakta madar.* |
| Hindi, | *pangra. pangara, dadap, mandara, panjira, pharad, dholdhak.* |
| English, | *coral tree, mochi wood.* |

(F.B. p. 541. F.B.I. Vol. II. p. 188. B.P. Vol. I. p. 398.)

A tree attaining 50 feet in height; bark armed with conical black prickles; young shoots and inflorescence clothed with stellate pubescence; leaves trifoliolate; leaflets entire, glabrous, membranous, truncate or broad-rhomboidal at the base, 4 to 6 inches long and broad, often broader than long; flowers scarlet (or white) in dense racemes, on peduncles up to 15 inches long; calyx very oblique, minutely 5-toothed at the tip, about 1 inch long; standard 2 inches long or more, wings and keel about ½ inch long; stamens much exserted; pod torulose, 6 to 12 inches long; seeds 1 to 8, smooth, dark red.

This is a soft-wooded shrub, or a medium-sized tree with yellowish or greenish-grey, smooth and shining bark, which peels off in thin papery flakes. Its branches are armed with conical black prickles, but these fall off when they are a few years old. The leaves are divided into three large broad leaflets, two of which are set opposite one another with the third, which is usually larger, at right angles to them and opposite the stalk. During the cold season the tree usually sheds its leaves entirely and the branches remain bare until, in February or March, the large bright scarlet flowers appear in dense tufts at the ends of the stems, to be followed later by the new leaves. The flowers have the structure of a pea-flower, but in this case the upper petal is very much larger than the others and the stamens project a long way beyond the rest of the flower. The pod is large and contains up to 8 seeds separated by distinct joints in the pod.

The tree is easily propagated by cuttings and grows very quickly; it is therefore often used to make hedges, and is also grown to support betel-vines and other climbing vegetables. The young leaves are eaten in curries and the mature leaves are used as cattle fodder. A red dye is sometimes obtained from the flowers and the bark is said to be employed in tanning and dyeing. The bark yields a fibre suitable for cordage.



ERYTHRINA INDICA

The wood, though very light and soft, is fairly tough and durable, and is in demand for certain purposes where lightness is important, particularly for the frames of sieves, for jars to be used for household purposes, and for boxes to be covered with lacquer. The weight is only about 20 lb. per cubic foot. The bark is used to cure dysentery and as a febrifuge. The leaves are employed to lessen pain in the joints, and their juice is said to relieve earache and toothache ; they are also considered useful in conjunctivitis and as an anthelmintic.

During the short period when the brilliant scarlet flowers appear on the bare branches the tree has great beauty, and although at other times of the year it is decidedly unattractive owing to its rather coarse leaves and ungainly habit, it is often grown in parks and gardens. A variety with white flowers (*var. alba*) is occasionally seen, and others with leaves variegated in different ways are also found.

The tree is a native of the coast of India and Malaya, including parts of the Sunderbans. It is very commonly planted near Calcutta and may also occur spontaneously.

**Erythrina ovalifolia** Roxb.

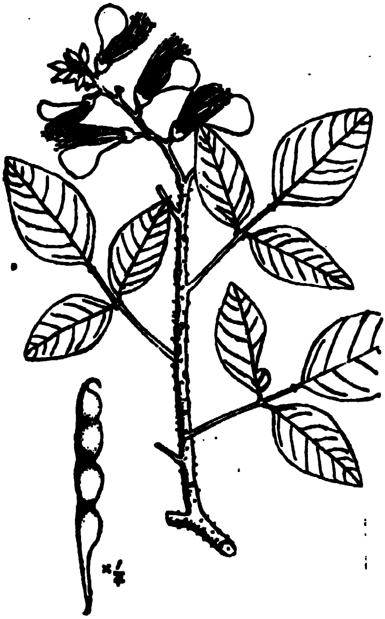
(Ovalifolia is Latin meaning "having oval leaves").

Bengali, *hari hakra*.

(F.I. p. 543. F.B.I. Vol. II. p. 189. B.P. Vol. I. p. 398.)

Leaves trifoliolate ; leaflets elliptic or elliptic-oblong, obtuse, glabrous, whitish beneath, subcoriaceous, twice as long as broad, up to 6 inches long ; racemes lax, 5 to 10 inches long, several at the ends of branchlets ; calyx campanulate, splitting irregularly into 2 or more unequal divisions, 1½ inches long and broad ; standard 2 inches long, broadly obcordate ; keel 1 inch long ; wings ¾ inch long ; pod torulose, 6 to 8 inches long, finely downy ; seeds 6 to 8.

This is a small soft-wooded tree with grey branches armed with dark brown prickles which arise from corky swellings of the bark. Except for the shape of the leaflets and the arrangement and shape of the flowers, the tree closely resembles *Erythrina indica* (see p. 158), but may easily be distinguished by the shape of the three leaflets which are always about twice as broad as long. In texture the leaflets are fairly firm, and are pale in colour on the lower surface, while their tips are more or less blunt. The flowers are perhaps less brilliant in colour than those of *E. indica,* and are borne in several loose clusters at the ends of the stems, not in one compact cluster as in the case of *E. indica*. The upper petal of the flower is not more than twice as long as the other petals.



*ERYTHRINA OVALIFOLIA*

This plant is indigenous in Ceylon, Malaya, Burma, Assam and lower Bengal, and although it is probably not wild in the neighbourhood of Calcutta, it is occasionally planted, instead of the much commoner *E. indica,* to form hedges and as a support for the betel vine.

The flowers appear in February and March.

**BUTEA.** (Named after a former Earl of Bute, a botanical author of the 18th Century). This is a genus containing 3 species, a tree, a shrub, and a climber, all natives of India. The leaves are divided into 3 leaflets, and the large, red or orange flowers grow in dense clusters ; there are nine stamens joined together and a tenth separate (diadelphous). The pod is leathery and broad, containing one seed near its apex.

*B. superba* Roxb. is an immense woody climber common in the dry forests of Central India. Its flowers and leaves are not unlike those of *B. monosperma,* but the petals are larger and more gorgeous in colour.

Roxburgh remarks, "When in flower I do not think the vegetable world offers a more gaudy show".

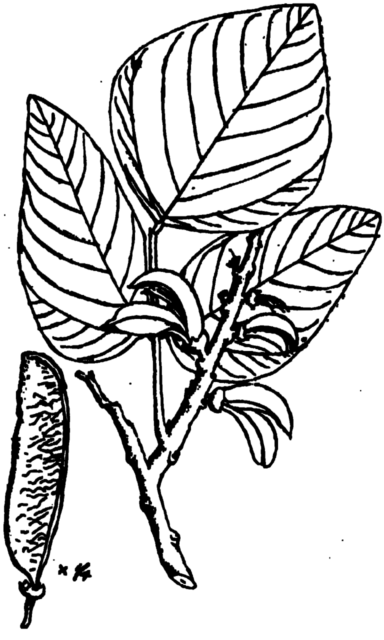
**Butea monosperma** Ktz. *Syn*. B. frondosa *Koen*.

(Frondosa is Latin meaning "covered with foliage". Monosperma is Greek meaning "with one seed").

| | |
|---|---|
| Bengali, | *palas, polashi.* |
| Hindi, | *dhak, palas, hakria, kankrei, chichra tesu desukajhad, chalcha.* |
| Urdu, | *palashpapra.* |
| English, | *flame of the forest, parrot tree, bastard teak, Bengal kino.* |

(F.I. p. 540. F.B.I. Vol. II. p. 194. B.P. Vol. I. p. 401.)

Young shoots tawny-tomentose; leaves trifoliolate; leaflets coriaceous, hard, the terminal obovate, obtuse, with cuneate base, 4 to 8 inches long and broad; the lateral oblique-ovate, smaller; racemes up to 6 inches long; pedicels brown-velvety, ¼ to 1 inch long; calyx campanulate, coriaceous, ½ inch long, brown-velvety; petals 2 or 3 inches long, equal, orange-red, clothed with grey pubescence; pod 6 to 8 inches long by 1½ to 2 inches wide, silvery-hairy, 1-seeded.



BUTEA MONOSPERMA

The palas is a small or medium-sized tree with a gnarled and crooked trunk, thick, grey, fibrous bark, and large dark green leaves divided into three thick and leathery, broad, rounded leaflets, of which the two lateral are opposite one another and the third is larger. In the cold weather the leaves mostly fall and the crooked branches remain bare until in February or March they become almost covered with short clusters of orange-red flowers, though some branches often remain leafy and bare of flowers. Each flower is shaped like the flower of a pea, but is much longer and narrower in proportion, rather resembling a lobster's claw. The short stalks of the flowers, the small calyx, and the buds before they open, are densely clothed with brown or black velvet, making a surprising and beautiful contrast with the red of the petals, which is softened by a fine silvery down that covers their surfaces. The large and coarse leaves soon follow the flowers, and once their freshness has faded the trees lose their beauty and become distorted and unattractive objects until their flowers again open in the following spring. The pods are broad, thickened near the tip where they contain a single seed, and thin near the base; their surface is strongly marked with nerves and covered with grey silky hairs; at first they are green, so that when they appear on branches bare of leaves they give the impression at a short distance of foliage; but they are yellowish-grey when ripe and are then so light that they are carried far and wide by the strong winds of the hot weather, thus ensuring a wide dispersal of the seeds.

This tree is very common in all the hotter parts of India except the wettest and the dryest areas. In many places it forms wide areas of scrub jungle, and looks like great stretches of flaming fire when the blossom is seen from a distance in the spring. In the vicinity of Calcutta the tree only occurs where planted, but in the dryer districts further west it becomes abundant, and it is said that the village of Plassey, where Clive fought his decisive battle about 90 miles north of the city, took its name from surrounding groves of the palas tree.

Next to the kusum (*Schleichera oleosa*), this tree is the most important host of the lac insect; the lac produced from it is more plentiful than that from other trees, but inferior in quality to lac grown on the kusum. The flowers provide a brilliant but fleeting yellow dye, and the bark gives a coarse fibre used for rough cordage and for caulking boats. The leaves are much used as plates, as umbrella coverings and as a substitute for wrapping paper, a regular trade in them for these purposes being carried on in some places. The foliage is collected as fodder for buffaloes, but goats will not eat it. Maggots can be killed by sprinkling the powdered seeds over them. The fibrous roots are made into ropes.

The wood is soft and not durable except underwater. It is used for well-curbs, piles, and for the scoops of wells, which are often made of pieces of this timber joined with leather. The weight is about 35 lb. per cubic foot. Charcoal of good quality is made from this wood.

A red gum obtained from the trunk, known as "Bengal kino," or "butea kino," is much used in medicine as an astringent, both for external and internal use. The powdered seeds are commonly employed as an anthelmintic, and to cure skin diseases. The bark and seeds are said to be of value in the treatment of snake-bite.

Hindus regard the tree as sacred to Brahma and it is used for worship in various ways. In the *homa* ceremony the twigs are offered with ghee in the sacred fire, the leaves being employed to pour the ghee. From the wood sacred utensils are made, and a staff of palas wood must be constantly held in the hand of a young Brahmin during the sacred thread ceremony, and during the period of learning under a *guru*. The three leaflets are regarded as emblematic of the Hindu trinity, and sometimes young Hindus wear the leaves as a sign that they are absorbed in religious study. The flowers are offered to the gods.

The tree is not common in Calcutta but it is occasionally planted in gardens and on roadsides. A fine specimen may be seen on the west side of Dalhousie Square (in 1944). Trees with yellow and white flowers are occasionally reported in various parts of the country.

As in the case of most trees with large red flowers, the pollination is carried out mostly by birds, which throng the trees when they are in flower, in search of honey.

The young seedlings produce a bulb-like swelling at the top of the root and "die back" at this point at the beginning of the hot weather, subsequently sending up a new shoot from the swelling. This is said to happen several years running irrespective of the amount of moisture available.

**BRYA.** (From the Greek "bruo", I sprout, in allusion to the fact that the seeds are said to germinate before they fall from the tree). A genus of 3 species of trees and shrubs, natives of Central America and the West Indies. The leaves take various forms, but often grow in clusters. The stamens are joined together, and the pod consists of several joints each containing a single seed. The branches are armed with spines at the bases of the leaves.

**Brya Ebenus** DC.

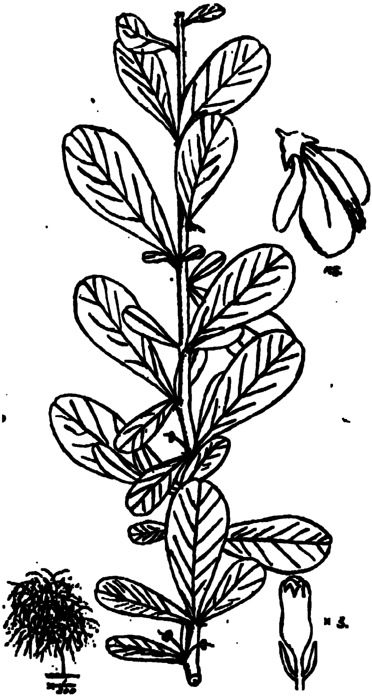
(Ebenus is from the Greek "ebenos", ebony).

English, *Jamaica ebony, green ebony, cocus wood.*

(Not in F.I., F.B.I. and B.P.)

An evergreen, glabrous shrub or small tree with stipular spines; leaves aggregated, usually in pairs, sessile. simple, obovate, often retuse, ¼ to ¾ inches long; flowers in fascicles at the ends of the branches, peduncles about 1/5 inch long; calyx green, 1/5 inch long, lobes 5, subequal; corolla orange, ½ inch long, standard suborbicular; stamens 9, monadelphous; pod torulose.

This is an evergreen shrub, or a small tree, often branched from its base, with rather rough, greyish-brown bark marked with longitudinal fissures, and many slender, dark-coloured twigs, which have a drooping tendency. The very small, shining leaves are closely set along the branchlets, and are usually grouped together in pairs. They have scarcely any stalks, and are broadest near their blunt and rounded tips. Near their bases are short sharp spines. The delicately scented, bright orange flowers are clustered, on short stalks, usually near the ends of the twigs, and are sometimes borne in great profusion. Each is shaped like the flower of a pea, the upper petal being large and almost round in outline. The nine stamens are partially joined to form a split tube round the ovary. The pod is divided into several joints each of which contains a single seed.



*BRYA EBENUS*

This very attractive plant is a native of the West Indies, but is now commonly grown in India for its graceful habit of growth and its fragrant orange flowers. It is often seen in Calcutta gardens. The flowers appear principally in March and April, but are also produced at other times during the hot season and rains.

The wood is very hard and dark in colour. It is used for making tools, knife-handles, etc., and is said to be the wood from which the truncheons of London policemen are made.

**CASTANOSPERMUM.** (Latin, meaning "chestnut-seed", owing to the resemblance of the seeds to the sweet chestnuts of Europe). This is a genus comprising two species of trees, natives of Australia, of which one is cultivated in India. The leaves are divided into two rows of leaflets with a terminal leaflet at the tip of the midrib (imparipinnate). The flowers are large and orange or yellow in colour with separate stamens. The pod contains 4 or 5 spherical seeds, and opens by 2 valves.

**Castanospermum australe** A. Cunn.

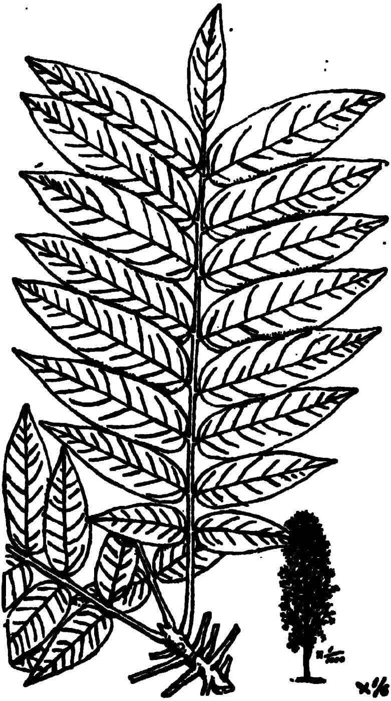
(Australe is Latin meaning "of the southern hemisphere").

English, *Moreton Bay chestnut, black bean.*

(Not in F.I., F.B.I. & B.P.)

Leaves imparipinnate, 1 to 2 feet long; leaflets about 15, elliptic, glabrous, coriaceous, stiff, about 5 inches long, the terminal leaflet smaller; flowers orange-red, in lateral or axillary loose racemes about 4 inches long; petals 1½ inches long; stamens free; ovary long-stipitate, many-ovuled; pod 4- to 5-seeded, 8 to 9 inches long; seeds globose, 1½ inches diam.

This middle-sized evergreen tree has a straight trunk, fairly smooth grey bark, rather drooping branches, and dense, handsome foliage. Its leaves are divided into a number of stiff, narrow, pointed, shining leaflets arranged in opposite pairs on either side of a central midrib with a terminal and smaller leaflet at the tip. During the hot weather the orange-red flowers are borne in small loose clusters among the leaves. Each flower is shaped on the pattern of the flowers of a pea, and contains ten separate stamens. The ovary grows on a minute stalk. The flowers are often borne in some profusion but are inconspicuous because they are largely concealed by the foliage. The large brown pods contain four or five round black seeds resembling chestnuts, which are scattered to a distance when the two valves of the ripe pods suddenly open with a twisting motion.



*CASTANOSPERMUM AUSTRALE*

The seeds are edible and after roasting are said to be not unlike roast chestnuts; they are eaten by the natives of Australia but seldom by Europeans and the people of India.

The wood is hard, and white with a yellowish tinge. It does not seem to be considered of any value.

The tree is a native of sub-tropical Australia, but is now widely cultivated in the tropics as a shade tree, for which purpose it is very suitable owing to its dense and handsome foliage. It is occasionally planted in Calcutta but it is not very successful as a roadside tree in Bengal because it is liable to be damaged by the high winds which are so common in the province. Several specimens may be seen (in 1944) on the north side of Lower Circular Road, south of the Victoria Memorial. The flowers usually appear in the early part of the hot season, and the new leaves with or soon after the flowers. Occasionally the tree flowers at other times.

### (2) CAESALPINIEAE.

This is the second sub-family of the *Leguminosae*, consisting almost entirely of trees, shrubs and climbers, all natives of warm countries. The leaves are generally divided into separate leaflets, which are either arranged in two rows on either side of a central midrib, usually without a terminal leaflet (paripinnate), or on either side of lateral branches of the midrib (bipinnate). The flowers are usually large and bisexual, and seldom symmetrical. The calyx is divided into 5 segments. The petals are 5 in number, and overlap each other when in bud with the upper petal inside. The stamens usually number 10 or fewer and are generally separate from one another.

The sub-family contains some of the most gorgeous and beautiful trees in the world. Not many of its members are wild in Bengal, but it is well represented in gardens.

**CAESALPINIA.** (Named after A. Caesalpini, an Italian physician and botanist, A.D. 1519-1603). This is a genus of about 40 species of trees, shrubs, and prickly climbers. The leaves are divided into small leaflets borne on branches (pinnae) of the midrib of the leaf (i.e. bipinnate). The calyx is cleft to the base, or nearly so, into 5 segments, which overlap when in bud. The 5 petals are nearly equal in size, and white, red, or yellow in colour. The 10 stamens are not joined to one another, and the pod is leathery and flattened, without wings.

As well as the trees described below, the genus includes *C. pulcherrima* Sw. (*Syn. Poinciana pulcherrima* Linn.) the Barbadoes pride (Bengali, *krishna chura*), a common garden shrub with orange or yellow flowers; and also several thorny, straggling shrubs which are common in lower Bengal, and often used for making hedges, of which the commonest is *C. Bonducella* Flem. (Bengali, *nata karanj*).

**Caesalpinia coriaria** Willd.

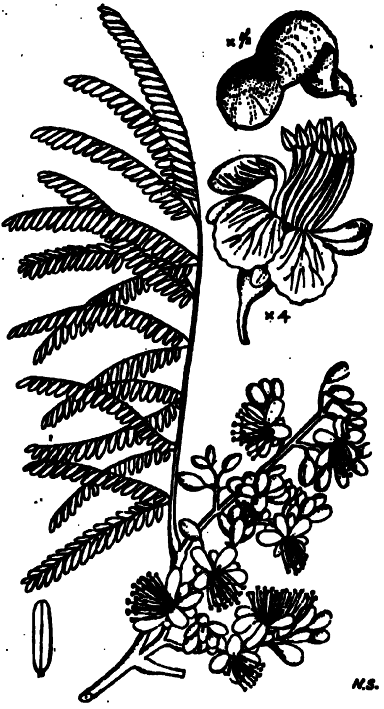
(Coriaria is Latin meaning "used for tanning".)

**English,** *divi-divi, American sumach.*

(Not mentioned in F.I., F.B.I. and B.P.)

Leaves bipinnate, up to 9 inches long by 5 inches wide; pinnae 13 to 17, 2 to 3 inches long; leaflets 40 to 60, ¼ inch long by 1/12 inch wide, greyish below; flowers scented, in dense terminal panicles 1 to 2 inches across; corolla 1/5 inch long and wide, pale yellowish, filaments reddish; pods thick, spirally twisted, not prickly.

This is a low tree with rough, grey-brown, corky bark flaking off in small irregular pieces, a short trunk, and wide-spreading branches which droop at their tips till they nearly touch the ground. The rather small leaves are divided into as many as a thousand diminutive narrow leaflets, which are closely set on either side of several slender branches of the midrib of the leaf. These branches, or "pinnae", are arranged in opposite pairs with a terminal one forming the end of the leaf. The leaflets are dark green above, but greyish on the lower surface. The small yellowish, or greenish, flowers grow in dense clusters at the ends of the branches; they are sweet-scented and attract an extraordinary number of butterflies and other honey-seeking insects to the tree when they appear at intervals during the hot weather and rains. The thick brown pods are curiously twisted, but not covered with prickles as are the fruits of so many members of this genus.



*CAESALPINIA CORIARIA*

This little tree is a valuable addition to a garden owing to its delicate foliage and its attractive, dwarf, umbrella-like shape. It is a native of the West Indies but is now commonly cultivated in the tropics, and is occasionally planted in Calcutta gardens. A tree may be seen (in 1941) on the west side of the Victoria Memorial garden. The trees are slow-growing, and in spite of their small size will live to the age of eighty years or more.

The pods yield a valuable tanning material and have been exported to Europe in large quantities for this purpose. They are also said to make a good black ink.

The timber is hard and very heavy, weighing up to 74 lb. per cubic foot. The heartwood is nearly black.

The pods are a powerful astringent, and are given to relieve periodic fevers. The bark is also used for the same purpose.

The new leaves are produced in March.

**Caesalpinia Cacalaco** Humb & Bomlp.

(Cacalaco is an American vernacular name).

(Not mentioned in F.I., F.B.I. and B.P.)

Leaves bipinnate, 6 to 9 inches long; pinnae 6 to 10; leaflets 6 or 8, obovate, often retuse, ½ to 1 inch long, glabrous; flowers in racemes panicled at the ends of the branches; racemes up to 9 inches long; flowers ¾ inch diam.; calyx subcampanulate, greenish; petals yellow, or orange, with darker spots, up to ½ inch wide; stamens 10, filaments flattened near base, white-tomentose, ½ inch long; anthers ovate, purple or brown; pod torulose, about 6 inches long, many-seeded.

This medium-sized tree has rough, brownish-grey bark marked with deep horizontal cracks, a stout trunk, and spreading branches. Its leaves are divided into a number of smooth leaflets, with blunt ends and pointed bases, arranged on either side of lateral branches of the central midrib of the leaf. The rather small yellow flowers grow in narrow, stiff spikes clustered in large numbers at the ends of the branches. Their buds are yellowish-green, and their petals are yellow or orange marked with minute reddish spots. The stamens are covered with white down, and bear purple or brown anthers. The long, cylindrical pod contains many seeds separated by an equal number of constrictions in the walls of the pod.

This tree is a native of South America but is not uncommonly cultivated in tropical countries for its delicate foliage and profuse display of yellow flowers, which in Calcutta have the merit of appearing in December and early January when very few other flowers are to be seen. It is not common in Bengal, but a fine specimen may be seen (in 1941) near the centre of the Curzon Gardens.

**PELTOPHORUM.** (From the Greek "peltophoros", a shield-bearer). This is a genus of about 7 species of splendid trees, all natives of the tropics, of which 2 are grown in India. The leaves are divided into numerous small, narrow leaflets arranged on lateral branches of the midrib of the leaf (bipinnate). The flowers are yellow with 5 roundish petals, and 10 separate stamens. The calyx is divided into 5 segments which overlap one another. The pods are flat and have a wing along each edge.

**Peltophorum inerme** (Roxb.) Llanos. *Syn.* P. ferrugineum *Bth.* Caesalpinia inermis *Roxb.*

(Ferrugineum is Latin meaning "rust-coloured" in allusion to the colour of the pods and young branches. Inerme means "unarmed", or "thornless".)

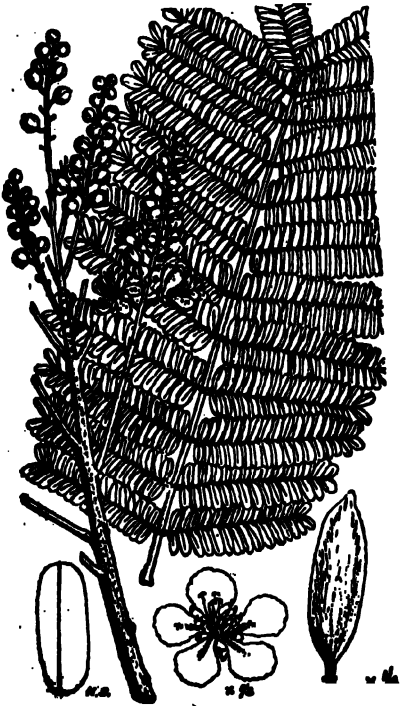
English, *yellow gold mohur, rusty shield-bearer, brasiletto wood.*

(F.B.I. Vol. II. p. 257. Not in F.I. & B.P.)

Young branches, petioles, rachis, and midrib of leaf beneath, ferruginous-pubescent; leaves bipinnate; pinnae 8 to 26; leaflets 20 to 30, opposite, obliquely oblong, obtuse, shining above, ½ to ¾ inch long;

racemes 5 to 6 inches long in a large erect terminal panicle; petals 5, roundish, crinkled, yellow with long ferruginous hairs on the back; stamens 10, unequal, yellow with orange anthers; stigma peltate; pod flat, indehiscent, 2 to 4 inches long, broadly winged along each suture, 1- to 3-seeded.

This magnificent evergreen tree has smooth grey bark, rather short branches, and elegant dark green foliage. Its leaves are divided into a large number of very small leaflets, which are arranged in opposite pairs on either sides of lateral divisions of the midrib of the leaf. The lateral branches (known as "pinnae") are themselves set in opposite pairs, and are closely crowded so that the numerous leaflets give a fairly dense shade. The midrib of the leaf, as well as the stalks and young branches, are covered with minute rusty brown hairs, but the upper sides of the leaflets are of a clear, dark, shining green, and the lower sides are pale and greyish. Many beautiful, yellow, scented flowers grow in large, stiff erect sprays at the ends of the branches, and are followed by large numbers of flat, winged pods, the shape of which is not unlike a long shield such as was carried by the Zulus, and has given rise to the name of the genus. The pods soon turn a handsome reddish brown, and continue to decorate the tree long after the flowers are over.



PELTOPHORUM INERME

This is one of the most ornamental of all tropical trees, and is very suitable for gardens, especially as it permits grass and other plants to grow beneath it. The flowers appear chiefly from the end of March till May, when their vivid yellow makes a magnificent contrast to the bright green of the leaves. The rusty-red pods soon follow the flowers, giving the tree a peculiar beauty of its own throughout most of the rainy season; and a second flush of flowers is often produced about September, at which time both yellow flowers and rusty pods may be seen on the tree together. The new leaves are mostly borne in February.

The sapwood is light, soft and of little value, but the heartwood is hard and blackish, and is used for cabinet-making.

The tree is a native of the Andamans, Ceylon, Malaya, and North Australia. It is commonly planted in India, and is plentiful in Calcutta gardens. It is easily propagated from seed.

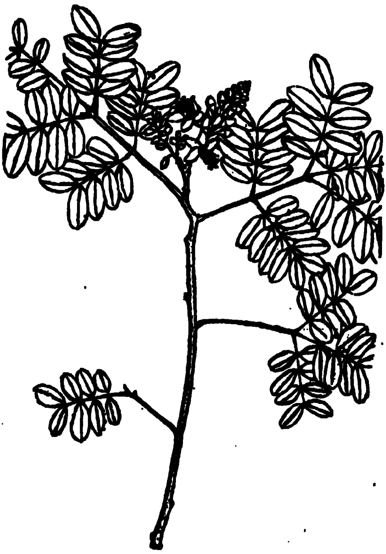
**Peltophorum brasiliense** Urmb.

(Brasiliense means "from Brazil")

(Not mentioned in F.I., F.B.I. & B.P.)

A small tree with slender branches ; leaves bipinnate, about 4 inches long by 3 inches wide ; pinnae usually 5 ; leaflets usually 8, ½ inch long by ¼ inch wide, greyish below, bright green above, elliptic, obtuse ; flowers in small axillary and terminal panicles ; calyx greenish yellow, tomentose, ⅓ inch long, unequally 5-lobed ; petals 5, about ⅓ inch long, ovate-elliptic, yellow, the posterior larger, reflexed, spotted with red ; stamens 9 or 10, subequal, free, filaments pilose ; ovary sessile ; pod flattish, narrowly winged.

This is a very graceful little tree, nearly evergreen, with a slender trunk, wide-spreading, drooping branches, and thin, smooth, brownish-grey bark, which flakes off in large pieces to show patches of lighter colour beneath. Its leaves are delicately divided into small leaflets, which are set on either side of the branches (pinnae) of the midrib of the leaf. There are usually four of these pinnae, set in opposite pairs, and a fifth at the end of the midrib, each of which usually has eight leaflets, also in opposite pairs. The leaflets are thin, and smooth, bright green above, and pale beneath. The rather inconspicuous flowers appear in small



*PELTOPHORUM BRASILIENSE*

clusters at the ends of the twigs or among the leaves. The calyx has five unequal, greenish lobes, and the five petals are bright yellow. One petal is larger than the others and is spotted with red. The pod is flattened and has two narrow wings along its edges.

Although its flowers are seldom striking, this small tree is a very valuable addition to Indian gardens owing to its remarkably graceful habit and delicate foliage. It has been only recently introduced into Calcutta, and is not as frequently grown as its merits warrant. A young specimen may be seen in the Zoo (in 1944) near the main gate.

The flowers are not often seen in Calcutta and appear to be produced in a curiously irregular manner. They sometimes appear in small numbers about May, and but rarely at other times, but very occasionally they may be produced in profusion in the cold season. The new leaves appear in the early part of the hot weather.

**DELONIX** (From the Greek "delos", evident, and "onux", a claw, in allusion to the shape of the petals). This is a genus of 3 species of trees, natives of tropical Africa and Asia, of which 1 species is commonly cultivated in India. The leaves are divided into numerous leaflets arranged on lateral branches of the midrib of the leaf (bipinnate). The flowers are large, and grow in broad clusters. The calyx segments are narrow, and green, and do not overlap one another. The 10 stamens are separate, and are exserted far beyond the petals. The long, flat, thin pods contain many seeds.

**Delonix regia** Raf. *Syn.* Poinciana regia *Boj.*

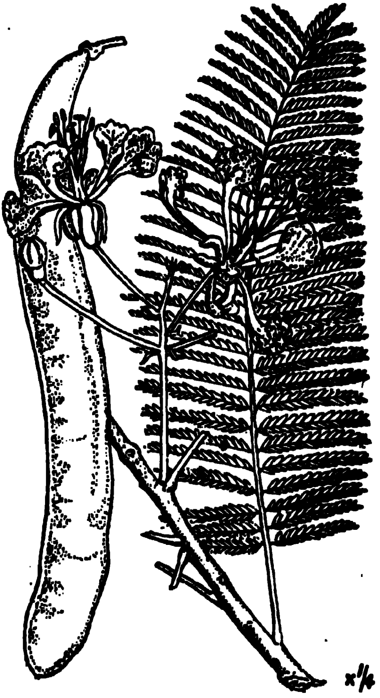
(Regia is Latin meaning "royal").

| | |
|---|---|
| Hindi, | *gul mohr, guli mohur.* |
| English, | *gold mohur,* (the usual name of this tree in Bengal, but applied to other trees elsewhere), *flamboyant, flame tree, peacock flower.* |

(F.B.I. Vol. II. p. 260. B.P. Vol. I. p. 446. Not in F.I.)

Leaves bipinnate, up to 2 feet long; pinnae 20 to 40; leaflets very numerous, about 1/3 inch long by 1/8 inch wide; flowers 3 to 4 inches across; petals obovate, clawed, about 2 inches long, red or orange, the upper petal striped with yellow or white; stamens 10, exserted, red; pod 12 to 24 inches long by 2 inches broad, flat, firm; seeds numerous, oblong, mottled.

This is a quick-growing tree with slightly rough, greyish-brown bark, and a rather slender trunk, which usually soon divides into a number of spreading limbs, bearing delicate feathery foliage. The large leaves are divided into many hundreds of diminutive leaflets, which are arranged in opposite pairs on lateral branches of the midrib of the leaf. The branches of the midrib are themselves set in opposite pairs, and are closely crowded, but the leaflets are so small that the leaves have a light and feathery appearance, which is accentuated by their rather pale greyish shade of green. Early in the hot season the foliage falls and, when the branches are almost bare, the brilliant flowers appear in profusion, growing in broad, erect clusters along the branches. The flowers first open in April, and continue along with the fresh new foliage till the rains of the monsoon arrive. They vary in colour from a deep crimson (a rare variety), through scarlet and orange, to a delicate salmon-colour. The five petals have broad blades with wavy edges and are attached by slender stalks ; four of them are of one colour and give their tone to the whole mass of blooms, while the fifth petal is streaked with yellow or white. The ten stamens are usually red and project far beyond the petals. The huge pods are flat, and thin ; they soon turn brown and hang long on the tree, often till the flowers of the following year appear.



*DELONIX REGIA*

The *gul mohr* is perhaps the most gorgeous of all ornamental trees and is well known in almost all tropical countries especially those near the sea. It is said to be a native of Madagascar, but it is not now found there in a wild state and may perhaps have originated in Mauritius. It is common in Calcutta gardens, streets, and parks, and its dazzling flowers make a magnificent spectacle in the hot season, especially when mingled with the yellow flowers of *Peltophorum inerme,* and the lilac blooms of *Lagerstroemia Flos-reginae,* the jarool.

As a garden tree the *gul mohr* has the merits of growing quickly and being ornamental at all times except during the short period when the branches are bare before the flowers appear, but unfortunately it is easily damaged by high winds, and has the disadvantage that grass and most other plants will not grow beneath it.

The wood is very light, soft, and of little value, though it is said to take a fine polish.

The seeds take a long time to germinate and often lie for two or three years in the soil before showing signs of life. The flowers are pollinated chiefly by birds.

**COLVILLEA.** (Named after Sir Charles Colville, once governor of Mauritius). This genus contains one species only. It differs from *Delonix* chiefly in the shape of its pod, which is not flat but round and full, and in its 5-coloured sepals, of which the upper 4 are joined together.

**Colvillea racemosa** Bojer.

(Racemosa is Latin meaning "with flowers in racemes or clusters like bunches of grapes").

English, *Colville's glory.*

(B.P. Vol. I. p. 446. Not in F.I. and F.B.I.)

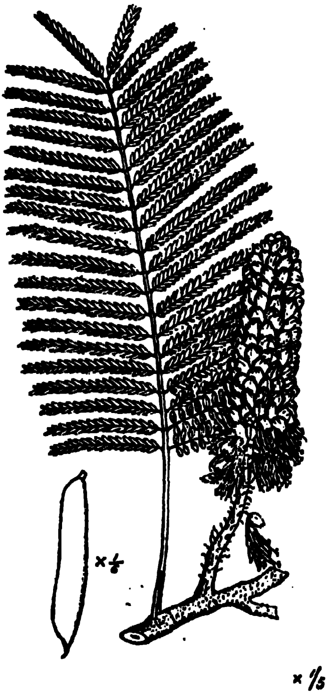
Leaves bipinnate, about 3 feet long; pinnae 40 to 60, 4 inches long; leaflets 40 to 60, about ¼ inch long; flowers 1½ to 2 inches diam., in dense pendulous racemes panicled at the ends of the upper branches, up to 18 inches long; bracts coloured, caducous; calyx coloured, irregular; petals about ¾ inch long, orange; stamens 10, about 1½ inches long, yellow; pod swollen.

This is a handsome tree which, when not in flower, closely resembles *Delonix regia*, the *gul mohr*. Its bark is brownish grey in colour with a pinkish or coppery tone, is studded with numerous small corky knobs or excrescences, and often peels off in thin, irregular flakes. The trunk is usually taller and stouter than that of the *gul mohr*, and the branches spread less widely. The feathery leaves are much larger than those of the *gul mohr*, but are divided in the same way into a great number of small leaflets arranged on branches of the midrib of the leaf (known as "pinnae"); the pinnae are more numerous than those of the *gul mohr* but the leaflets are fewer and rather larger. The flowers are borne in dense cone-like, or sausage-like, spikes, which hang in clusters from the tips of the upper branches. Their petals are short and stiff, and orange in colour. There are ten reddish-orange stamens, which project a long way beyond the petals, forming by far the most conspicuous part of the flower. The pods are not flat but more or less round in section.

This is a tree that well deserves a place in any garden owing to its graceful foliage alone, while its flowers, though insignificant compared with those of its gorgeous relative the *gul mohr,* can sometimes be very handsome, and have the merit of appearing when few other trees are in bloom. The leaves fall in the early hot season and are replaced by new leaves in May. The flowers appear at the end of August and last throughout most of September, when the tops of the trees are sometimes covered with masses of dull orange blooms.

The flowers attract great number of bees and other insects, but birds also assist in their pollination.

The tree is believed to be indigenous in East Africa, but was first found in Madagascar, where a single tree was discovered under cultivation by the natives. It is now grown in many tropical countries but is nowhere common. A number of trees exist in Calcutta and specimens may be seen in the Zoological and Belvedere Gardens, and at the junction of Mayo Road with Chowringhee.



*COLVILLEA RACEMOSA*

**SCHIZOLOBIUM.** (From the Greek "schizo", split, and "lobos", a lobe, alluding to the manner of the opening of the pod). This genus comprises one or two species of tall trees, natives of Brazil and Panama. The leaves are large and divided into numerous small leaflets set on either side of branches from the midrib of the leaf (bipinnate). The calyx is unequal-sided with segments overlapping in bud and reflexed in flower. The petals number 5, and are unequal in size and shape. The 10 stamens are separate from one another, while the pod is more or less flat and contains only 1 seed enclosed in the wing-like interior of the pod.

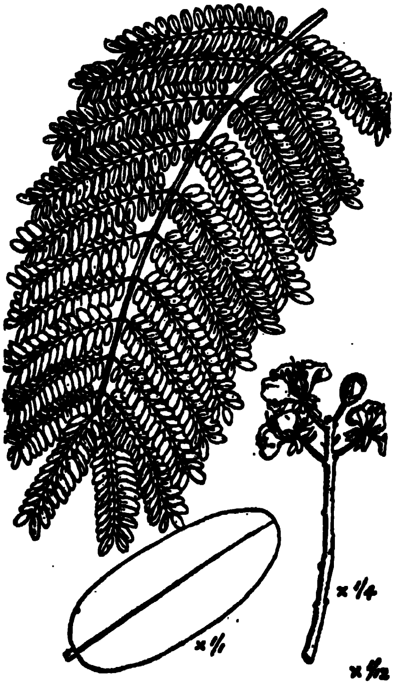
**Schizolobium excelsum** Vog.

(Excelsum is Latin meaning "lofty").

(Not in F.I., F.B.I. & B.P.)

A tall, deciduous tree; leaves bipinnate, about 3 feet long; pinnae up to 40; leaflets up to 40, 2 inches long, oblong, shortly petioluled, whitish beneath; flowers yellow about 1 inch diam., in large terminal panicles; calyx turbinate, oblique, segments reflexed; petals 5, clawed, unequal; stamens 10, separate; pod compressed, obovate, 1-seeded, dehiscent.

This tall and handsome tree resembles *Colvillea racemosa* in many respects, but may be distinguished by its much larger leaflets, and by its broad clusters of bright yellow flowers. The trunk is usually tall, straight and fairly stout, the branching taking place at some distance above the ground. Its bark is smooth, and greyish with a pink or coppery tint. The very large leaves have a beautiful fern-like appearance, and are clustered near the ends of the branches. They are divided into numerous leaflets, which are fewer and larger than those of *Colvillea racemosa* and *Delonix regia*. At the ends of the branches the brilliant yellow flowers grow in large open clusters, unfortunately at such a height from the ground that they cannot always be clearly seen. The pod is short, fairly flat, broadest near its tip, and contains only a single seed.



*SCHIZOLOBIUM EXCELSUM*

This fine tree is a native of Brazil. It grows to perfection at low altitudes in the Indian hills, and it is occasionally planted in lower Bengal. where it sometimes thrives fairly well. The yellow flowers are borne in the hot weather when the tree is often a magnificent sight. The leaves fall during the cold season and are replaced at about the same time as the flowers appear. Unfortunately the branches are brittle, and it is unsafe to plant this tree in position where their fall may do damage.

A number of young trees have been recently planted in Calcutta gardens.

**PARKINSONIA.** (Named after John Parkinson, an apothecary and author of London, 1567-1620). This is a genus of 3 species of trees, of which 2 are natives of America, and 1 of South Africa, one of the American species being universally cultivated in the tropics. The leaves are divided into small leaflets set on the lateral branches of a very short midrib, the leaflets being sometimes minute or altogether wanting. The calyx is deeply cleft into 5 narrow segments which overlap very slightly while in bud, and the petals are broad, the uppermost having a long claw. The 10 stamens are shorter than the petals, while the pod is swollen, with narrow constrictions between the seeds, to release which the pod finally splits open (dehiscent).

**Parkinsonia aculeata** Linn.

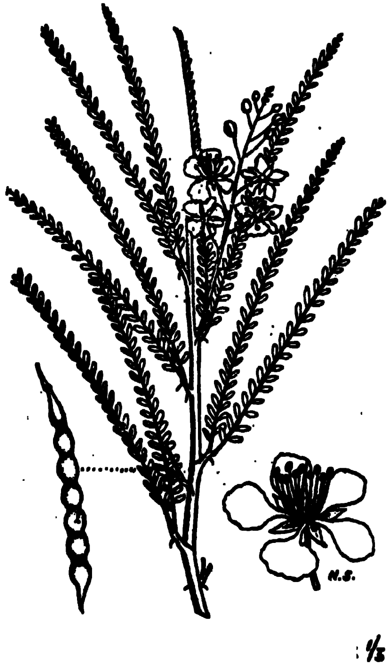
(Aculeata is Latin meaning "thorny").

| | |
|---|---|
| Bengali, | *belati kikar.* |
| English, | *Jerusalem thorn.* |

(F.B.I. Vol. II. p. 260. B.P. Vol. I. p. 446. Not in F.I.)

A glabrous bush or low tree; stipules spinescent; leaves bipinnate; main rachis very short, reduced to a spine; pinnae 2 to 6, rachis 6 to 12 inches long, flattened, crowded; leaflets minute, oblanceolate, obtuse, scattered, sometimes wanting; flowers about ½ inch diam. in short, lax racemes; calyx deeply cleft, segments lanceolate, subvalvate, subequal; petals broad, yellow, the upper with a long claw; pod 3 to 6 inches long, turgid, dry, moniliform, dehiscent; seeds usually 4 to 7.

This is a shrub or small tree with very thin brown or green bark, the younger stems and twigs being of a clear, vivid, polished green. At first sight the plant may appear to have grass-like foliage, but in reality the leaves are divided into separate leaflets in the same way as are those of other nearly related plants, the leaflets being arranged in rows on either side of branches from the central midrib of the leaf. (Leaves so divided are said to be "bipinnate"). In this case the central midrib is very short, usually ending in a sharp spine, while two, four, or six branches (known as "pinnae") spring from the midrib in opposite pairs. Frequently there is only one pair of pinnae, in which case the midrib is so short as to be scarcely noticeable, and each pinna may then be mistaken for a separate leaf. The leaflets are arranged in two rows on the pinnae, as in the case of other bipinnate leaves, but in this case they are reduced to insignificant scales, and are sometimes altogether wanting. In any case the tree appears at a little distance to have only clusters of narrow grass-like leaves at the ends of its slender green twigs. The rather handsome yellow flowers are borne in small loose clusters at the bases of these curious leaves,. The pods are roundish in section, but long and slender, with narrow constrictions between the seeds giving the whole the appearance of a string of beads. The flowers appear at most times of the year but particularly in the hot season.



*PARKINSONIA ACULEATA*

This plant is very quick-growing, and is much used for making hedges, for which purpose its thorns make it specially suitable, though it is reported to be very injurious to other plants growing nearby. The smaller branches and twigs are lopped for feeding goats, and the white, close-grained wood makes a good fuel and charcoal. A beautiful white, but brittle, fibre is said to be obtained from the bark.

The tree is a native of tropical America, but is now universally cultivated and naturalised in many places. It is common in the dryer parts of India, and is occasionally met with near Calcutta, especially about villages. In 1939 some of these trees were growing on the bank of the Hooghly at Diamond Harbour.

**ACROCARPUS.** (From the Greek "akros", outermost, or at the top, and "karpos", a fruit). A genus containing 3 species of trees, natives of south-eastern Asia. The leaves are large and are divided into separate leaflets, which are set on either side of branches of a central midrib (bipinnate). The flowers are red or orange in colour and have only 5 stamens each. The pods are thin and flat with many seeds.

**Acrocarpus fraxinifolius** W. & A.

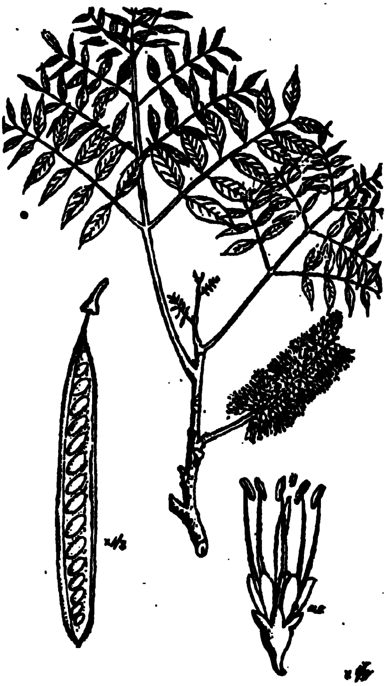
(Fraxinifolius is Latin meaning "with leaves like an ash")

| | |
|---|---|
| Bengali, | *mandania.* |
| English, | *shingle tree, pink cedar, red cedar, mundani.* |

(F.B.I. Vol. II. p. 292. B.P. Vol. I. p. 445. Not in F.I.)

A large deciduous tree; leaves bipinnate; pinnae 8, a foot or more long; leaflets 10 to 12, nearly sessile, oblong, rather oblique, glabrous, subcoriaceous, 3 inches to 4 inches long; flowers in dense, erect, simple racemes; sepals 5, ¼ inch long; petals narrow, scarlet; stamens 5, twice as long as petals; pod thin, flat, long-stalked; seeds many, obovate, oblique.

In its native country this is said to be a very tall, erect tree attaining over 180 feet in height and having a trunk as much as 50 feet high before any branches occur ; but when planted in lower Bengal the tree does not attain this great size, and the trunk usually branches a few feet from the ground, above which point several slender limbs rise almost vertically upwards, giving the tree a distinctive but rather ungainly appearance. Its bark is fairly smooth, and greyish-brown in colour, and the trunk is often buttressed at its base. The long and slender twigs bear very large leaves divided into separate leaflets, set on eight branches of the midrib of the leaf, which are arranged in four opposite pairs. The small scarlet flowers are borne in dense spike-like clusters, each flower having five narrow petals and five much longer stamens. The thin, strap-shaped pods contain a number of seeds.



*ACROCARPUS FRAXINIFOLIUS*

The tree sheds its leaves during the cold season, and the flowers appear in February and March, after which the new leaves appear. The young foliage is more or less crimson for a short period.

The hills of South India, Assam, Burma, and the base of the Himalayas are the homes of this tree, but it is occasionally planted in the plains of India, and is much used as a shade tree in coffee plantations. A specimen grows in the Royal Agri-Horticultural Society's garden in Alipore and two others (in 1942) near the rifle range at Belghurriah.

Although this tree has always been described as an "erect tree", it has been noticed in Calcutta that it has the unusual power of starting life as a climber, making use of an existing tree as a support, and becoming itself an erect tree after it has smothered and destroyed its host.

The timber is fairly hard and strong, fairly durable, and easy to work. It seasons well but is apt to split. It is used for boxes and for shingles. Its weight is about 43 lb. per cubic foot.

**SARACA.** (A West Indian vernacular name). This is a genus of about 6 species of trees, natives of India and Malaya, of which 1 is commonly found in India. The leaves are divided into several leaflets arranged in opposite pairs on either side of a central midrib (paripinnate). The flowers have no petals, but the calyx is coloured and is surrounded by coloured bracts. The slender stamens number 2 to 8, and are exserted beyond the calyx. The pods are flat and leathery, and open to release the seeds (dehiscent).

Several other species are occasionally found in Indian gardens.

**Saraca indica** Linn. *Syn.* Jonesia Asoca *Roxb.*
(Indica means "of India").

| | |
|---|---|
| Bengali, | *asoka.* |
| Hindi, | *asok, ashok.* |
| English, | *asoka tree!* |

(F.I. p. 312. F.B.I. Vol. II. p. 271. B.P. Vol. I. p. 444.)

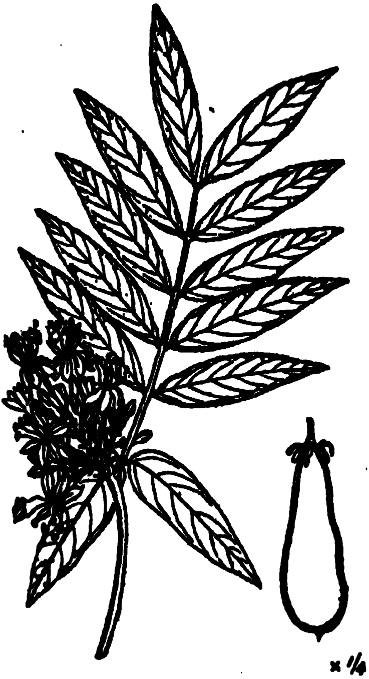
Leaves pinnate; leaflets opposite, 6 to 12, elliptic, 3 to 9 inches long, glabrous, rigidly subcoriaceous; flowers in dense corymbs 3 to 4 inches broad; pedicels ¼ to ½ inch long below the coloured, oblong-spathulate, amplexicaul bracteoles; calyx-tube ½ inch long, lobes ¼ to ⅓ inch long; petals none; perfect stamens 7 to 8, nearly 1 inch long, scarlet; pod 4 to 10 inches long by 2 inches wide, 4- to 8-seeded, flat.

The asoka is a small spreading tree with smooth brownish bark, and evergreen foliage forming a dense rounded crown. The leaves are divided into several narrow, pointed, smooth leaflets set in opposite pairs on either side of the midrib. When young the leaflets hang limply downwards in bunches from the ends of the branches; at first their colour is greyish-white, which quickly turns to a reddish tint, and ultimately, as the leaflets mature to their final stiff consistency, becomes a clear dark green. The small delicately scented flowers are yellow or orange when they first open, but by the action of sunlight gradually change to vermilion. They grow in great profusion in small, broad clusters close to the spreading branches, their general appearance being reminiscent of the flowers of a red *Ixora*. They have no petals and their beauty depends on the small coloured bracts with which they are surrounded, the petal-like lobes of the calyx, and the slender projecting stamens. The flat, leathery pods are covered with net-like markings; they are slightly curved, pointed at the tip, and often have a pronounced notch in the middle of their outer edge. The young pods are purplish in April, but turn darker as they ripen.

Both Hindus and Buddhists revere this tree. The word "asoka" means sorrowless, and the tree is regarded as a symbol of love, being dedicated to Kama Deva, the god of love, in whose quiver the bloom of the asoka was one of the five flowers that formed the five arrows with which he kindled passion in the hearts of human and celestial beings. Hindu ladies are said to drink water in which six asoka blossoms have been immersed in order to preserve their children from trouble and grief. The leaves are used in the celebration of the Durga pujah. To Buddhists the tree is sacred because Gautama Buddha was born beneath its shade.

The flowers are much used for temple decoration. They are especially attractive at night, when they exhale a delicate scent for some distance around.

According to Sanskrit poetry the tree is so sensitive that if touched by a lovely woman it bursts into flower and blushes crimson.



*SARACA INDICA*

The wood is soft and weighs about 50 lb. per cubic foot. It seems to be of little value, but is used for building purposes in Ceylon.

Medicinally the bark is employed to cure internal haemorrhages and to beautify the complexion. The flowers, pounded and mixed with water, are considered useful in acute dysentery.

The tree is a native of many parts of India and Malaya. It is common in Bengal gardens and near temples, thriving best in shady situations. The flowers appear from the end of February till June.

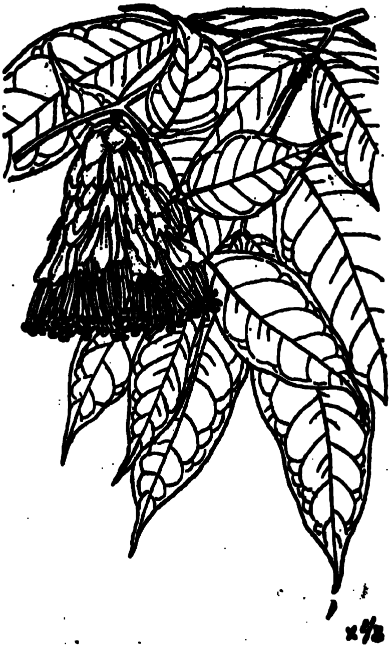
**BROWNEA.** (Named after P. Browne, an English naturalist in the West Indies, 1720-1790). This is a genus of about 10 species of trees and shrubs, natives of tropical America. The leaves are divided into separate leaflets arranged in opposite pairs on either side of a central midrib (paripinnate). The flowers are red or pink, and are borne in dense showy clusters close to the branches. There are 5 nearly equal petals, and 10 or more stamens which are joined for about half their length, and are exserted beyond the petals. The pods are flat and curved.

In addition to the small tree described below, several other shrubby species of this genus are found occasionally in Calcutta gardens. The best of these is *Brownea grandiceps* Jacq., known as the "rose of Venezuela", which has very large spherical heads of bright red flowers borne at the ends of the branches.

**Brownea coccinea** Jacq.

(Coccinea is Latin meaning "scarlet").
English, *West Indian mountain rose.*
(Not in F.I., F.B.I. & B.P.)

Leaves pinnate, up to 12 inches long; leaflets 10 to 14, up to 5½ inches long by 2 inches wide, elliptic, acuminate; petiolules short bractlets enclosing the bud, up to 4 inches long, pinkish, caducous flowers scarlet in corymbs about 3 inches wide on lower side of branches petals 5, spathulate, 1½ inches long; stamens 11 or 12, joined for about half their length, red; pods compressed, curved, nearly glabrous, about 8 inches long.



*BROWNEA COCCINEA*

This is a small evergreen tree, often branching from near the base, with dense, shady foliage. The leaves are divided into several narrow, pointed leaflets arranged in opposite pairs on a central midrib. The young leaves are enclosed in pinkish scales which fall to the ground to expose the leaflets hanging limp and colourless from the ends of the branches. As the leaves mature they become mottled with red or purple, but finally the leaflets acquire a glossy green tint and stand out stiffly from the midrib. During the heat of the day the leaves tend to droop, but at night they raise themselves and expose the scarlet flowers, which by day are usually partially hidden. The smaller branches and twigs are studded on their lower sides with compact round heads of flowers, which at first are very like red rhododendrons. They are sometimes borne in such profusion that the spreading branches are weighed down by them. The pods are flat and scimitar-shaped.

This tree when not in bloom closely resembles both *Saraca indica* and *Amherstia nobilis*, but the round compact clusters of flowers are quite distinctive.

The tree is a native of Jamaica. It is now widely cultivated in India and is common in Calcutta gardens. The flowers mostly appear in February and March, but they are also seen at other times, especially in September.

**AMHERSTIA.** (Named after Lady Sarah Amherst, an artist and collector in India, d. 1838). A genus containing a single species, a native of Burma. The leaves are divided into separate leaflets set in opposite pairs on a central midrib (paripinnate). The flowers are crimson in pendulous sprays, with 5 very unequal petals of which 2 are minute, and 10 stamens of which 9 are joined. The pod is flat and opens to release the seeds (dehiscent).

**Amherstia nobilis** Wall.

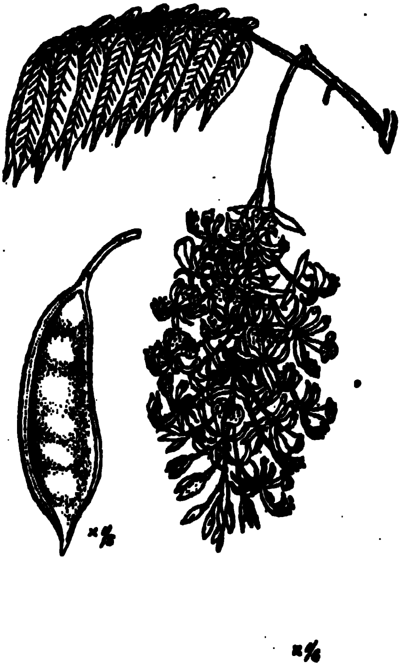
(Nobilis is Latin meaning "noble", or "stately".)

English, *tree of heaven.*

(F.B.I. Vol. II. p. 272. Not in F.I. & B.P.)

Leaves paripinnate, up to 18 inches long; leaflets 12 to 16, oblong, acuminate, glabrous, subcoriaceous, opposite, 6 to 12 inches long; flowers in pendulous racemes; pedicels 2 to 4 inches long with a pair of lanceolate red bracteoles enclosing each bud; calyx segments 4, petaloid, red, membranous; petals 5, 3 large and unequal, mixed red and yellow, the upper one 2 inches long and broad; also 2 minute petals; stamens 10, diadelphous, alternately longer, the longer 2 inches in length; pod 6 inches long by 1½ inches broad, glabrous, truncate, 4- to 6-seeded.

This tree has been described as the most beautiful object in the whole vegetable kingdom, and many people on seeing its graceful hanging sprays of delicate red and yellow flowers below the handsome foliage would probably be willing to agree with this contention. The leaves are divided into several opposite pairs of narrow, pointed, smooth leaflets set on either side of a central midrib, and closely resemble the leaves of *Saraca indica* and of *Brownea coccinea.* The resemblance extends to the young leaves, which at first hang limply from the ends of the branches and while in this flaccid state assume various beautiful shades of pink, copper-colour, mauve, or purple, but soon turn a bright shining green as they gather strength and firmness. The wonderful flowers hang in immense candelabrum-like clusters from all parts of the tree, the upper flowers usually having longer stalks than the lower, so that the clusters are conical in shape with the broader ends of the cones uppermost. Each flower has three brilliant red and yellow petals, of which the upper petal is by far the largest, and ten prominent stamens, of which five are much longer than the others, and nine are joined together below, the short and the long being arranged alternately. There are also four petal-like calyx lobes, which curve backwards above the petals, the tube of the calyx being narrow and as long as its lobes. The flower-stalks are also red, and the buds are enclosed in two conspicuous, slender red leaves (known as "bracteoles"), which are almost as large as the petals, and are nearly as long as the tube and the lobes of the calyx together. The pod is flat, hairless, and smooth, containing from 4 to 6 seeds; in April the young pods are brilliant crimson with greenish markings.



*AMHERSTIA NOBILIS*

As the clustered flowers of *Brownea* are reminiscent of red rhododendrons, so the hanging sprays of *Amherstia* are not unlike the flowers of orchids, and perhaps it is necessary to seek among that family if any rivals to its magnificent, yet delicate, flowers are to be found.

The wood is hard and white with a pinkish tinge, weighing about 50 lb. per cubic foot.

The tree is a native of Burma, where it is much cultivated but seldom found in a wild state. It is occasionally planted in Calcutta gardens, but is not common, since it is delicate and difficult to propagate. A fine specimen may be seen in the Belvedere garden west of the main building, and there are several in the Royal Agri-Horticultural Garden.

The flowers appear from the end of January to April. The new leaves are produced almost throughout the year.

**TAMARINDUS.** (A latinised form of an Arabic word meaning "Indian date"). This is a genus containing a single species distinguished by small leaves divided into diminutive leaflets set in opposite pairs on a central midrib (bipinnate), flowers with 3 unequal petals, and 3 stamens united to the middle.

**Tamarindus indica** Linn.

(Indica means "of India".)

| | |
|---|---|
| Bengali, | *tentul, tintil, tintiri, tetai, nuli, ambli.* |
| Hindi, | *amli, imli, ambli, nuli, tamrulhindi.* |
| Urdu, | *imli.* |
| English, | *tamarind.* |

(F. I. p. 530. F.B.I. Vol. II. p. 273. B.P. Vol. I. p. 444.)

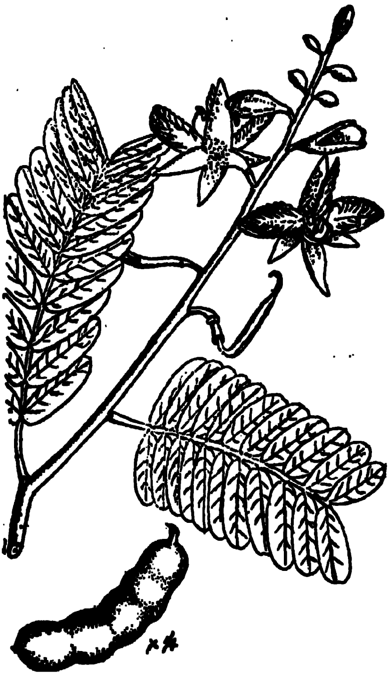
A large glabrous tree; leaves paripinnate, up to 5 inches long, narrow; leaflets 20 to 40, opposite, oblong, obtuse, about ½ inch long; flowers about ½ inch long in lax racemes; calyx-tube turbinate, segments 4; petals 3, unequal, red and yellow; stamens 3 united to the middle; pod thick, filled with pulp, brown, irregularly curved; seeds 3 to 12, brown, shining.

The tamarind is a very handsome evergreen tree with thick, dark grey, rough bark marked with cracks and fissures. The trunk is usually rather short, and the branches, when the tree is not crowded by other trees, spread widely, the lower branches being almost horizontal. The leaves are very thick and in spite of their small size and their division into many leaflets, throw a dense shade over a wide area. When young the leaves are of a brilliant emerald, but they soon fade to a soft jade green, which, together with their feathery look, gives the tree a very distinctive appearance. All over the branches the rather inconspicuous flowers are borne in small loose clusters among the leaves; each flower has three unequal petals, variegated yellow and red, and three stamens, the other two petals being reduced to minute scales. The pods are more or less oval in section, long, curved and irregularly swollen; they are brown in colour and contain several shining seeds set in fibrous pulp.

This is one of the best known of Indian trees, since it is commonly planted by roadsides and in "topes" as a shade tree, and is often found in villages owing to the attraction of its fruit and the many other valuable products that can be obtained from it. Unfortunately, owing, it is said, to acid contained in its leaves, most other plants have difficulty in growing beneath it, and it is therefore unsuitable for gardens in spite of the great beauty of its delicate foliage and its fine spreading limbs. For the same reason it is generally believed by Indians that the neighbourhood of a tamarind is unhealthy, and even that those who sleep beneath its branches are in danger of catching leprosy.

Tents pitched under it in wet weather are said soon to get damaged by the action of the leaves.

The fruits are valued for their acid pulp and also for their seeds, both of which are eaten. There are a number of varieties, of which the most important are the common sour-fruited variety, a variety with sweet pulp, and another with a reddish pulp, which is specially prized. The pulp is a favourite ingredient of curries and chutneys, and also for making sherbet. A large trade is carried on in the pulp in some parts of India, and it is exported in considerable quantities to Europe and elsewhere. In times of scarcity the seeds are pounded and eaten, and the kernels, when the outer skin has been removed by roasting and soaking, are boiled or fried. The young plants, leaves, and flowers, are also eaten.



*TAMARINDUS INDICA*

The seeds ground to powder and mixed with gum make a strong cement, and are used, among other purposes, for dressing country-made blankets. The seeds also give an amber-coloured oil which is made into a varnish to paint idols. The leaves yield a red dye and give a yellow shade to cloth previously dyed with indigo. An infusion of the fruit mixed with sea-salt is used for brightening silver, and the pulp of the pods for cleaning metal utensils.

The wood is hard, close-grained, and very durable if not exposed to the weather. It is difficult to work, but highly prized for wheels, mallets, planes, rice-pounders, furniture, and turning. The sapwood weighs about 62 lb. and the heartwood about 80 lb. per cubic foot.

Medicinally the tree has a great many very varied uses. The bark is tonic and astringent, and is said to restore sensation in cases of paralysis. The leaves are used to wash wounds and to reduce inflammation. A poultice of the flowers is given to relieve conjunctivitis. The pulp of the fruit is often eaten as a laxative, and the seeds are employed in the treatment of dysentery.

The fruits were well known in Europe during the middle ages for their medicinal qualities, having been introduced by the Arabs, who appear to have come to know the tree through the Hindus. The Arabic name of the tree has become naturalised in English, and has given the botanical name to the genus.

In some parts of India the tree is believed to be haunted by spirits. In Burma it is considered to induce heat in the surrounding country.

The tree grows to a very large size and great age. A specimen with a girth of 42 feet has been recorded in Ceylon, and trees have been known to live well over 200 years. The new leaves usually appear in May, and are closely followed by the flowers, but the trees vary considerably in this respect and occasionally one may be seen putting forth its fresh leaves and flowers in September. The dark brown pods often hang on the tree till the flowers of the following season appear.

The tamarind is believed to be indigenous in tropical Africa, but is now widely cultivated in the tropics, and is common in India wherever frost does not often occur. It is abundant on roadsides near Calcutta but is seldom seen in the city, possibly owing to the general belief that it has an unhealthy influence on its surroundings. Although a magnificent avenue tree it is not planted on the Maidan, perhaps because it would be damaged by people in search of its fruit, flowers, and leaves.

**HAEMATOXYLON.** (From the Greek "haima", blood, and "xulon", wood, in allusion to the colour of the heartwood.) This is a genus of 3 species of trees, natives of tropical America, of which one species is often cultivated in gardens. The leaves are divided into several small leaflets arranged in opposite pairs on a central midrib (paripinnate). The calyx segments do not overlap one another, and the stamens are separate. The pods are flat and pointed, opening along one side.

**Haematoxylon campechianum** Linn.

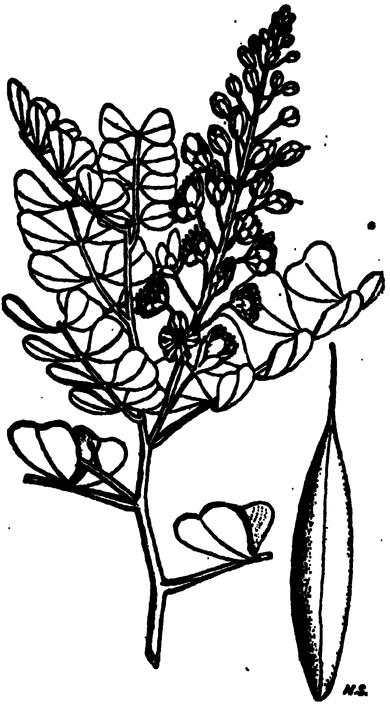
(Campechianum means "of Campeachy", a place in Mexico.)

| | |
|---|---|
| Bengali, | *bokkan.* |
| Hindi, | *patang.* |
| English, | *logwood, Campeachy tree.* |

(Not in F.I., F.B.I. & B.P.)

**Leaves paripinnate, about 3 inches long; leaflets opposite, 6 or 8, glabrous, obovate, retuse, ¼ to 1 inch long, bright green, subsessile; flowers small, yellow, in axillary racemes; calyx segments valvate; petals 5, oblong; stamens free with hairy filaments; ovary short-stiped, free; pod lanceolate, flattened, dehiscent; seeds usually 2.**

This is a low, spreading tree with a crooked, buttressed, and much indented trunk covered with dark brown bark, which peels off in small flakes. Its small leaves usually spring several together from the same point, and are elegantly divided into several opposite pairs of broad, blunt leaflets, of a pale, bright green colour, and broadest near their tips. The little, pale yellow flowers grow in narrow spikes from the twigs near the bases of the leaves, and appear in great profusion, very fragrant and beautiful. The buds are of a handsome brownish-purple before the petals open. The small pods are narrow, flat, pointed, and papery in texture.



*HAEMATOXYLON CAMPECHIANUM*

The wood is hard, the sapwood being white and small in quantity, and the heartwood brown or red. The latter is a very valuable dye-wood, and is largely exported from the West Indies to Europe and elsewhere, a decoction of the chips being used to dye fabrics violet, blue, and black. The wood is also employed in the manufacture of ink. It weighs about 65 lb. per cubic foot.

Medicinally the heartwood is used as a tonic and astringent in the treatment of dyspepsia and diarrhoea. It is also made into an ointment for application to gangrene.

The tree is a native of Central America and the West Indies. It is often grown in Indian gardens for its very delicate foliage and its masses of scented flowers which appear from the end of

January to March. It is specially suitable for planting on small lawns because it allows grass to grow beneath it.

**CASSIA.** (An ancient Greek name). This is a large genus containing about 400 species of herbs, shrubs and trees, mostly natives of the tropics, of which about 15 are natives of India, and many others are cultivated in this country. The leaves are divided into two rows of leaflets set in opposite pairs on a central midrib (paripinnate). The flowers are usually showy, and pink or yellow in colour. The calyx is deeply divided into 5 segments, which overlap when in bud, and the petals are broad and nearly equal. The stamens number 10 or less; they are often unequal in length, and their anthers mostly open by terminal pores. The pods vary in shape, but the numerous seeds are usually separated by transverse partitions of the pod.

This genus contains some of the most beautiful flowering trees and shrubs to be found in India. In addition to the trees described below, several species of shrubby cassias with yellow flowers are cultivated in Bengal. The best known of these is *C. alata* Linn., which is naturalised near Calcutta and common in gardens. It has stout branches, very large leaves with 16 to 24 broad leaflets up to 6 inches long, and bright yellow flowers in stiff erect spikes, each bud being enveloped in a large yellow hood (or "bract").

Three species of small undershrubs, or herbs, of this genus are common on waste land near Calcutta and in most other parts of India; all have yellow flowers, and are much used in Indian medicine, chiefly to cure skin diseases. They and the other local species may be distinguished by the following key, which is intended to assist in the identification of all the cassias usually to be found in Calcutta:—

I. Flowers yellow.
  A. Small undershrubs or herbs, weeds of waste land, etc.
    (1) Herbaceous, leaflets 6; pods very slender. *C. Tora.*
    (2) Shrubby; leaflets 6 to 10; pod flattish. *C. orientalis.*
    (3) Shrubby; leaflets 12 to 20; pod rather thick. *C. Sophera.*
  B. Large shrubs or trees.
    (1) Flowers in long hanging clusters (racemes); leaflets up to 6 inches long; a small tree. *C. Fistula.*
    (2) Flowers not in long hanging clusters.
      (a) Flowers in stiff erect spikes; leaflets 16 to 28, 2 to 6 inches long; a shrub. *C. alata.*
      (b) Flowers in broad clusters at ends of branches.
        (*i*) Leaflets more than 30, not more than ¼ inch wide; a shrub or small tree. *C. multijuga.*
        (*ii*) Leaflets 12 to 28, dark green above; anthers 7; pod 6 to 9 inches long; medium-sized tree. *C. siamea.*
        (*iii*) Leaflets 6 to 18, glaucous; anthers 10; pod 3 to 6 inches long; a shrub or tree. *C. glauca.*

II. Flowers orange tinged with pink. *C. moschata.*

III. Flowers more or less pink or mauve.
  A. Leaflets 12 to 24, flowers 1½ to 2 inches diam.
    (1) Leaflets pointed, mostly 2 inches long or more; flowers March to August. *C. nodosa.*
    (2) Leaflets blunt, mostly less than 2 inches long; flowers mostly in April. *C. javanica.*
  B. Leaflets 14 to 40; flowers about 1 to 1½ inches diam.
    (1) Pod rough, curved, slightly flattened; leaflets narrow, round at both ends; young leaflets often reddish; flowers mostly February-March; bracts very small, falling before the flowers open. *C. grandis.*

(2) Pod smooth, straight, cylindrical; young leaflets not reddish; bracts conspicuous, persisting till the flowers open.
  (*a*) Leaflets rounded at base, 3 to 4 times as long as broad; flowers mostly April-May. *C. renigera.*
  (*b*) Leaflets narrowed at base, unequal-sided, about twice as long as broad; flowers mostly June-July. *C. marginata.*

The above key is not exhaustive, for several other species of *Cassia* with yellow flowers are sometimes cultivated in Bengal gardens; moreover the accuracy of some of the identifications is perhaps slightly uncertain because there has been considerable confusion in the names given to cassias in Calcutta, and some errors have crept into books by well-known authorities. Furthermore the subject is complicated by a number of apparently hybrid plants which are now grown in gardens. Hybrids between *C. nodosa* and *C. javanica* seem to be common, and it is even doubtful whether the two species are actually distinct. A very beautiful tree, which may be a hybrid between *C. nodosa* and *C. Fistula*, produced by the Royal Agri-Horticultural Society of India and named *C. alipurensis*, has the habit of *C. Fistula*, but with smaller leaves, pale ivory-coloured flowers, and the swollen filaments of *C. nodosa*. Another tree named *C. Lancasteri* appears to be a hybrid between *C. marginata* and some other species with pink flowers; it produces a fine show of deep pink blooms in the early part of the rains, much superior to those of *C. marginata*.

A single specimen of *C. moschata* H. B. & K., a very beautiful tree which in March produces pendulous clusters of pinkish-orange flowers in great profusion, is to be seen in the Royal Agri-Horticultural Gardens in Alipur.

**Cassia Fistula** Linn.

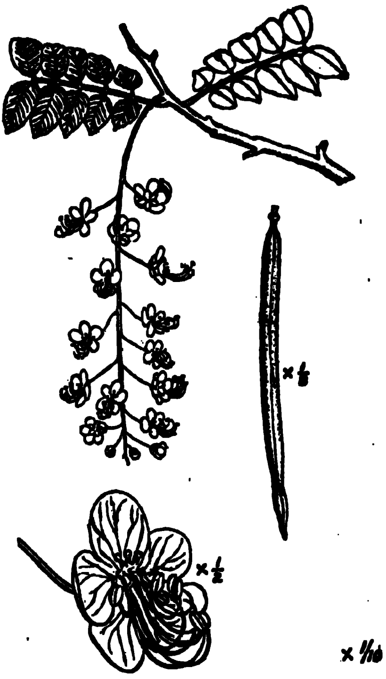
(Fistula is Latin meaning "a pipe"; the bark of the tree, when imported into Europe for medicinal purposes, used to arrive rolled up in the form of tubes. This is said to have given rise to the name, but perhaps more probably it refers to the shape of the pods).

| | |
|---|---|
| Bengali, | *amultas, bandarlati, sonali.* |
| Hindi, | *amaltas, bandarlauri, girmalah.* |
| Urdu, | *amaltas.* |
| English, | *Indian laburnum, pudding pipe, purging cassia, golden shower.* |

(F. I. p. 348. F.B.I. Vol. II. p. 261. B.P. Vol. I. p. 437.)

Leaves pinnate, up to 15 inches long; leaflets 8 to 16, glabrous when mature, ovate, acute or shortly acuminate, up to 5 inches long; petiolule 1/6 to ¼ inch long; flowers 1½ inches across, in lax pendulous racemes up to 20 inches long; petals 5, yellow, obovate, subequal; 3 stamens with long curved filaments, anthers opening by longitudinal slits; 4 stamens with short filaments, anthers opening by pores; 3 stamens small without pollen; pod cylindric, 2 to 3 feet long by 1 inch thick, brown or black; seeds 40 to 100 in dark pulp, separated by transverse partitions.

This is a small or medium-sized tree with a rather untidy habit of growth, and bark which is smooth and greenish-grey when young, but brown and rough when old. Its large leaves are divided into two rows of broad, pointed leaflets arranged in opposite pairs on either side of the slender midrib. The leaves fall during the cold weather and the early part of the hot season, but in April, as the last of the old leaves vanish, the large, bright yellow flowers appear in graceful hanging clusters. Each flower has five broad, yellow petals and ten yellow stamens, of which three are long and curve elegantly outwards along with the slender style, four are short with large anthers, and three are much smaller and lacking in pollen. The fresh leaves grow along with the flowers, which continue till the new foliage is fully developed. During the cold weather, and even up to the time when the flowers open, the tree is often conspicuous for its immense, blackish, slender, cylindrical pods which hang long on the bare branches; they contain a large number of flat seeds, each embedded in a dark pulp, and separated from the next seed by a transverse partition.



*CASSIA FISTULA*

When in a full flower this is one of the most beautiful of trees, its clear, pale yellow blooms hanging in graceful sprays being difficult to compare to anything in nature except perhaps the flowers of *Laburnum vulgare* Griseb, the laburnum of English gardens; (which however has only a superficial resemblance to the Indian tree, for it has pea-like flowers and belongs to the subfamily *Papilionaceae*). When not in flower the pudding pipe is a rather unattractive and ungainly plant, especially when, as often happens, its leaves are damaged by insect pests and its bark by human marauders; but its great black pods hanging from leafless branches in the cold and hot seasons give it a bizarre grace of its own; and even when they persist until the flowers appear, in the opinion of some they add to the beauty of the whole tree.

The pulp of the fruit, and also the root-bark, form one of the commonest and most useful of Indian medicines, a simple purgative or laxative. The pulp is the *Cassiae pulpa* of the *Brit. Pharmacopoeia*. The fruit is also used to cure leprosy, heart diseases, and abdominal pains. The root is a strong purgative and has been given as a febrifuge. The leaves allay chillblains and are regarded as useful to relieve inflammation, while both the bark and leaves are used to cure skin diseases. The parched leaves are eaten mixed with food as a mild laxative.

The bark is sometimes employed in tanning and to yield a light red dye. The sticky pulp of the pods has a sweet taste and is valued in Bengal for flavouring tobacco. The flowers and leaves are sometimes eaten by men, though they are rejected by cattle and goats. Curiously enough bears, jackals, and monkeys eat the highly purgative pods with impunity and so play a large part in the distribution of the seeds, which would otherwise be destroyed by insects before escaping from the pod.

The timber is hard and durable, but difficult to work, and only available in small sizes. It is used chiefly for making tool handles, posts and agricultural implements. The weight is about 60 lb. per cubic foot.

The flowers are used by Hindus in religious ceremonies and as temple-offerings. In Mysore stakes cut from the tree are fixed in the ground and worshipped.

The tree is frequently planted in Indian gardens. Several varieties exist, the best of which retain the full clear yellow of their flowers, while the flowers of other varieties tend to turn to a dull creamy yellow soon after opening. The tree is common in jungles and thickets near Calcutta, but seldom shows up to advantage, except in gardens, owing to the damage done to the trees by people in search of the flowers, fruit, and bark. It is indigenous in most of the forests of India and Burma.

**Cassia nodosa** Buch-Ham.

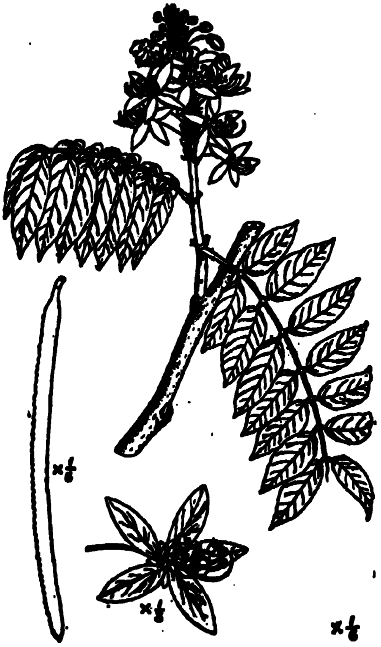
(Nodosa is Latin meaning "knotty", or "gnarled", in allusion to the large knots seen on the trunk and branches of this species).

English, *pink cassia, pink mohur.*

(F.I. p. 349. F.B.I. Vol. II. p. 261. B.P. Vol. I. p. 437.)

The youngest shoots silky; leaves paripinnate; leaflets 12 to 24, 2 to 4 inches long, thinly coriaceous, glabrous, elliptic-oblong, acute; petiolules ¼ inch long; stipules narrow, falcate; flowers pink, in erect racemes from the scars of fallen leaves; bracts narrow lanceolate, pubescent; sepals 1/5 inch long; petals ¾ to 1 inch long; 3 stamens long and curved with large globose thickenings in the middle of the filaments and anthers opening by slits; 4 short with anthers opening by pores; 3 minute, sterile; pods cylindrical, 12 to 18 inches long.

This very beautiful, nearly evergreen tree, when grown in the open, has a short gnarled trunk and very wide-spreading branches, which form a broad umbrella-like dome, the outer branchlets tending to droop till they sometimes nearly touch the ground ; but when grown amongst other trees, the trunk is capable of attaining a considerable height in its search for light, and the tree then takes a comparatively slender outline but with a crooked trunk. Its bark is greyish, or yellowish-brown, smooth when young, with numerous, narrow but deep, horizontal clefts. The leaves are divided into two rows of narrow, pointed, shining leaflets, considerably larger than those of the other pink-flowered cassias, but like them arranged in two rows in opposite pairs on either side of a slender midrib. The scented flowers appear in large loose clusters along the branches ; they are larger than the flowers of the other pink cassias, and fade gradually from a bright pink to almost white. The five petals are narrow and pointed at both ends, while three of the stamens are much longer than the others and curve gracefully outwards beyond the petals together with the slender style. In the middle of the stalk, or "filament", of each of the three long stamens is a curious bulge or swelling, a peculiarity common to some of the other cassias. The pods are round in section, and contain a number of seeds divided by transverse partitions and set in evil-smelling pulp.



*CASSIA NODOSA*

This is the most handsome of the pink cassias, and is a truly lovely sight when covered with masses of pink and white flowers reminiscent of apple blossom. Its leaves are graceful, and its broadly spreading habit is an added attraction when sufficient space is available, while it has the further advantage of remaining in flower from March till long after the rains have broken, whereas the other pink cassias bloom for one or two months only. The new leaves are produced in April together with the flowers.

This tree closely resembles *Cassia javanica,* and hybrids between the two species seem to be so common that one is led to think that the two trees are not specifically distinct. They may, however, usually be distinguished by the larger and pointed leaflets of *C. nodosa,* and by its narrow petals, pointed or contracted at both ends.

*Cassia nodosa* is a native of Malaya, Burma, Sylhet, and the Chittagong hills. It is very commonly grown in Calcutta gardens.

The wood is fairly hard and weighs about 40 lb. per cubic foot. The sapwood is light brown and the heartwood red.

**Cassia javanica** Linn. *Syn.* C. bacillus *Roxb.*

(Javanica means "of Java". Bacillus is from the Latin "bacillum", a small rod, probably in allusion to the pods.)

English, *Java cassia.*

(F.I. p. 350. F.B.I. Vol. II. p. 267. Not in B.P.)

Leaves paripinnate, 6 to 12 inches long; leaflets 4 to 28, usually 16 to 28, oblong, obtuse or emarginate, smooth, 1 to 2 inches long; petiolules very short; stipules crescent-shaped, lower half narrower; calyx segments 5, dull reddish; petals oblong, unequal; stamens 10, the 3 lower much longer having an ovoid swelling in the middle of the filaments; pods cylindrical, 18 to 24 inches long by ¾ inch diam., dark brown, rather smooth.

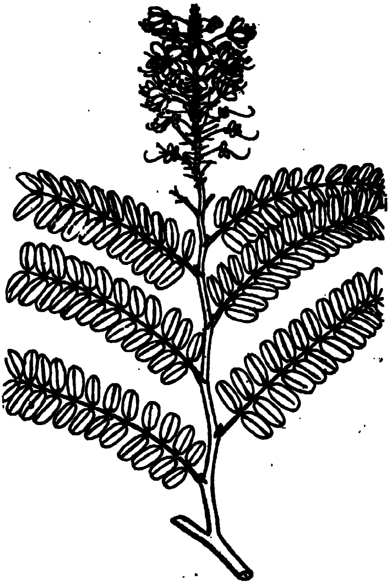
This is a very beautiful tree with fairly smooth brownish or pinkish-grey bark, usually a short trunk, and widely-spreading, almost horizontal branches with drooping tips, which form a wide umbrella-like canopy. Its leaves are divided into a number of narrow, blunt leaflets, of a bright green colour and soft smooth texture, set in two rows in opposite pairs on either side of a slender midrib. The bright pink flowers grow in open clusters mostly on short leafless branches, which spring from near the scars of fallen leaves. The five petals vary in size, but all have the same rather narrow shape with blunt ends, and are prettily veined. Three of the stamens much exceed the others in length, having an oval swelling in the middle and a double curve below it. The pod is round in section, and very long, with a fairly smooth, dark brown surface.

This graceful tree is very like *Cassia nodosa,* and some doubt exists whether the two species are really distinct. *C. javanica* may, however, be distinguished by its smaller, blunt leaflets, its blunt petals, and its calyx which is brown, purplish or reddish, whereas that of *C. nodosa* is usually green; moreover the flowers of *C. javanica* are mostly borne on short leafless branches, but those of *C. nodosa* often grow on the ends of leafy twigs. But hybrids between the two species seem to be common.

The tree is used medicinally as a substitute for *Cassia Fistula*.

Java and Sumatra are the native home of this species, but it is now widely planted in the tropics. In Calcutta it seems to be very scarce though hybrids between it and *C. nodosa* appear to be more plentiful. A specimen of the true *C. javanica* may be seen (in 1942) on the east side of the Zoological Gardens.

The flowers appear mostly in April and although very beautiful while they last, have the disadvantage that they are soon over, whereas those of *C. nodosa* persist until the rains break, and long after. The hybrids between the two species seem to produce flowers that last little longer than those of *C. javanica*. The new leaves are produced at about the same time as the flowers.



*CASSIA JAVANICA*

**Cassia renigera** Wall.

(Renigera is Latin meaning "kidney-bearing" in allusion to the shape of the stipules, i.e. the small leafy attachments at the bases of the leaf-stalks).

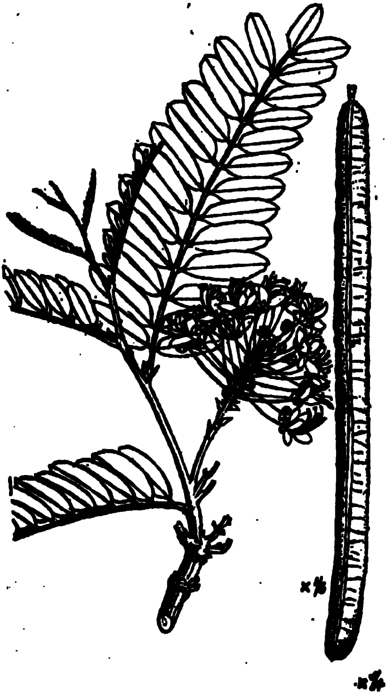
English, *Burmese pink cassia.*

(F.B.I. Vol. II, p. 262. Not in F.I. & B.P.)

Deciduous, softly tomentose; leaves paripinnate up to 14 inches long; leaflets 16 to 40, oblong, obtuse, rounded at the base, membranous, softly pubescent, 1 to 2 inches long, by ½ inch wide; stipules large, reniform; flowers scented, pink (or yellow), in short racemes from the old wood; bracts large, ovate, acuminate; pedicels 1½ to 2 inches long; sepals and petals silky; petals elliptic-oblong, 2/3 to 1 inch long; stamens longer with a cylindrical thickening in the middle of the filament; pod cylindric, 15 to 18 inches long.

This is a small deciduous tree with spreading and drooping branches. Its bark is fairly smooth, brownish grey in colour, and covered with small corky excrescences. The leaves are gracefully divided into a number of very narrow, blunt leaflets covered with minute down, and arranged in two rows in opposite pairs on a slender midrib. The pink scented flowers appear in April and May in short clusters along the bare parts of the branches.

From other cassias this species may be easily distinguished by the broad leaflets (bracts) which grow at the base of each flower, and the soft silky hairs which cover the calyx and petals; but the stamens resemble those of *C. nodosa* and *C. javanica* in having large swellings in the centre of the three longest, the remaining stamens being very much shorter. The pod is round in section, long, and almost black.



*CASSIA RENIGERA*

This is a beautiful tree with a graceful habit, elegant leaves, and lovely deep pink flowers which are often borne in great profusion; but they are perhaps less striking than those of *C. nodosa*, and *C. javanica*, and it shares with the latter tree the disadvantage of having only a short flowering period from April to May. The leaves begin to fall during the cold weather and the branches are bare when the first flowers open, but the new leaves then appear together with the flowers.

The tree is a native of the interior of Burma. It is occasionally planted in Indian gardens, but is far from common in Calcutta. A specimen may be seen in the Agri-Horti. Garden at Alipore. A variety with yellow flowers is found in Burma, but does not seem to have been introduced elsewhere.

**Cassia marginata** Roxb. *Syn.* C. Roxburghii *DC.*

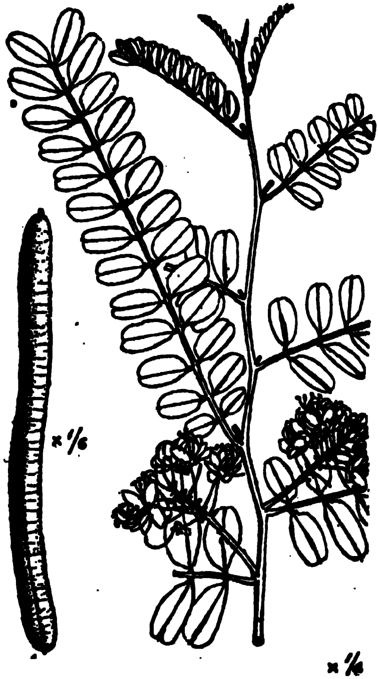
(Marginata is Latin meaning "with a distinct margin", in allusion to the slightly thickened margins of the leaflets).

English, *red cassia, red Indian laburnum.*

(F.B.I. Vol. II. p. 262. Not in F.I. & B.P.)

Branchlets and young leaves silky; leaves paripinnate; leaflets 20 to 30, membranous, glabrous above, oblong, oblique, emarginate and apiculate, about 1 inch long; stipules hastate or falcate; racemes axillary, or terminal; pedicels ½ to 1 inch long; bracts large, ovate or obovate; petals ½ inch long, deep pink; 3 stamens long and curved with anthers opening by slits, filaments not swollen; 4 shorter with anthers opening by pores; 3 minute and sterile; pod cylindric, 8 to 12 inches long, almost straight, smooth, spongy within.

This is a small graceful tree with deeply cracked, brown bark, spreading and drooping branches, and normally a short trunk, though when compelled to do so to escape from the shade of other trees, the trunk can attain a fair height. The leaves are smaller and more slender than those of the other pink cassias, and are divided into a number of unequal-sided leaflets set in two rows on either side of a central midrib. The small, fragrant, cerise or terra-cotta flowers grow in narrow clusters among the leaves and from the leafless parts of the branches, often in very great profusion. Three of the stamens are much longer than the others but are devoid of the conspicuous swellings that are so noticeable in some of the other cassias. The pods are round in section, smooth, and fairly straight.



*CASSIA MARGINATA*

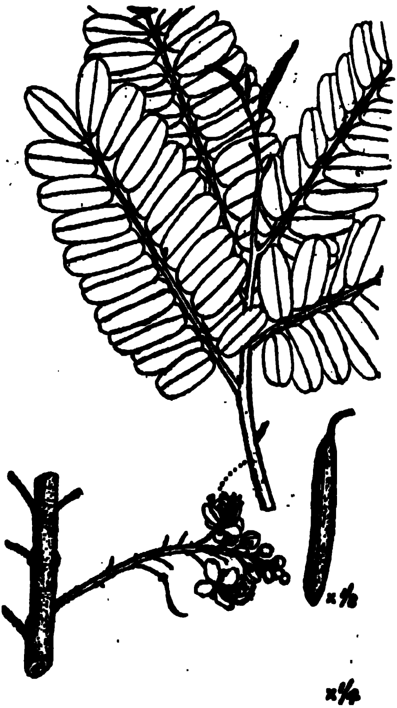
This beautiful little tree is a native of South India. It is an admirable garden tree but is not often grown in Calcutta. Specimens may be seen (in 1942) near the eastern boundary of the Zoological Gardens.

The flowers appear principally in June and July.

The wood is strong and durable, weighing 60 to 80 lb. per cubic foot. It is used for the naves of wheels and the handles of instruments.

**Cassia grandis** L.f.
(Grandis is Latin meaning "large").
English, *horse cassia, pink shower.*
(Not in F.I., F.B.I., & B.P.)

Twigs, leaves, and petioles rusty-pubescent when young; leaves paripinnate, up to 12 inches long or more by 2½ inches wide; leaflets 20 to 40, oblong, abrupt at both ends, acute, more or less pubescent, about 1½ inches long; flowers in numerous long racemes, pinkish; pod compressed-cylindrical, transversely rugose, woody, massive, glabrous, 1 to 3 feet long.



*CASSIA GRANDIS*

This is a spreading tree with fairly smooth grey bark. When growing in the open the trunk is short and the branches form a broad round dome covering a wide area with their drooping twigs; but if planted with other trees the trunk is capable of reaching a fair height, though it does not grow straight. The slender leaves are divided into a number of rather narrow leaflets set in two rows in opposite pairs on a slender midrib; when young they are usually reddish in colour (a characteristic very useful in distinguishing this tree from other cassias), and the young shoots and leaves are more or less covered with minute, rusty-coloured down, as also often are the midribs of the more mature leaves. The foliage falls in the cold weather, and the flowers appear in February, March, and April (sometimes when the tree is almost leafless), on numerous, rather stiff, open spikes scattered along the branches. When in full sunlight the flowers are of a bright pale pink, but those grown in the shade often have a yellowish tinge. The massive black pods are coarse-skinned, rather flattened and slightly curved ; they contain a pulp between the seeds with a very disagreeable smell.

This is a larger tree than the other pink-flowered cassias, and is the earliest to produce its flowers in the spring ; but although a very beautiful tree when in full bloom, it does not equal the others as a garden plant. South America and the Caribbean Isles are its home. It is now widely cultivated in the tropics, but in Calcutta it is rather uncommon. A specimen may be seen on the western boundary of the Belvedere garden not far from the Infantry Lines, and another near the 14th tee on the Tollygunge Golf Course.

The pulp of the pods is used as a purgative.

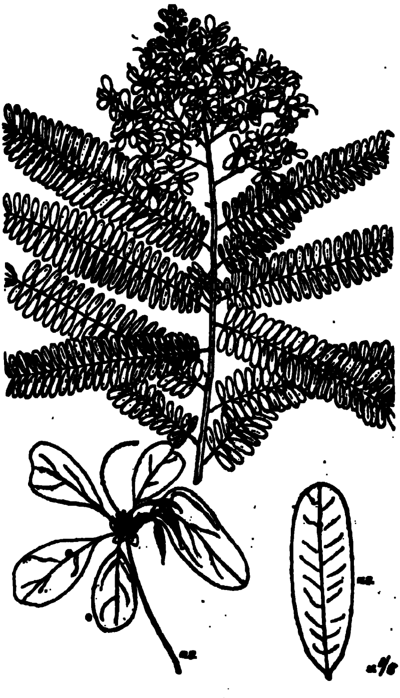
**Cassia multijuga** Rich.

(Multijuga is Latin meaning "having many pairs of leaflets".)

(Not in F.I., F.B.I., & B.P.)

Leaves paripinnate, clustered near ends of branches, up to 9 inches long by 2 inches wide ; leaflets up to 50, oblong, obtuse, mucronate, minutely puberulous, pale beneath, 1 inch long by ¼ inch wide ; flowers bright yellow, 1½ inch diam., in large terminal panicles ; petals spreading, oblique, ovate, clawed ; perfect stamens 7, 2 usually much larger ; pod flat, several-seeded.

This is a small, slender tree, or a large shrub, with thin branches which often spring from ground-level. Its bark is fairly smooth, brownish-grey in colour, and covered with minute corky lumps. The very elegant leaves are divided into a large number of narrow, soft-green leaflets set in two rows in opposite pairs on a central midrib ; they are clustered near the tips of the slender twigs leaving the greater part of the branches bare of foliage. The bright yellow flowers grow in magnificent, stiff, open clusters at the ends of the branches. The pod is flat and contains several seeds.



*CASSIA MULTIJUGA*

The tree is quick-growing, but brittle and rather short-lived. It is justly popular in gardens owing to its graceful foliage, and for the glorious display of brilliant yellow flowers that it produces from September to November at a time when few other shrubs and trees are in bloom.

Tropical America is the home of this species, but it is now widely cultivated in the tropics, and is not uncommon in Calcutta gardens.

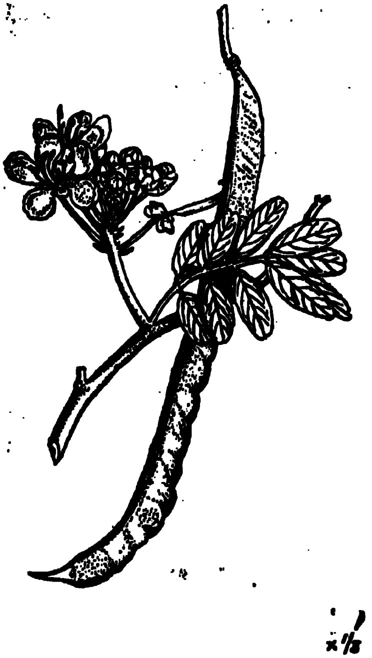
The new leaves are produced in February. The tree very rarely bears fruit in the climate of Bengal.

**Cassia siamea** Lam. *Syn.* Senna sumatrana *Roxb.*

(Siamea means "of Siam". Sumatrana means "of Sumatra".)

(F.I. p. 353. F.B.I. Vol: II. p. 264. B.P. Vol. I. p. 438.)

Leaves paripinnate, about 12 inches long; leaflets 12 to 20, chartaceous, elliptic-oblong, mucronate, glabrous, 2 to 3 inches long; racemes in a large terminal panicle which is often 2 feet long; flowers yellow, about 1½ inches diam.; perfect stamens 7, nearly equal; pod flat, thickened at sutures, minutely velvety, 6 to 9 inches long, many-seeded.



CASSIA SIAMEA

This is an evergreen tree of moderate size having nearly smooth, grey bark marked with slight longitudinal fissures. Its dark green, glossy leaves are divided into two rows of narrow, pointed leaflets arranged in opposite pairs on the slender midrib. The yellow flowers grow in large, open clusters at the ends of the branches, each flower having five almost equal petals, and seven stamens that produce pollen, the remaining three stamens being wanting, or small and sterile. The flat pods are purplish or brown when ripe, and contain a number of seeds; when young they are soft and ribbon-like.

This handsome tree is very often planted on roadsides and in "topes" as an ornament and for the deep shade afforded by its dense, dark green foliage.

The flowers appear from June to January, and are usually at their best in October, when they often make a fine show ; but the stiff, ungainly clusters of rather scattered flowers cannot match the beauty of most of the other tree cassias. The new leaves are mostly produced in February and March, but the branches are never leafless.

The timber is hard and highly valued, though seldom obtainable in large sizes. The sapwood is whitish, but the heartwood is dark brown to nearly black, prettily marked in stripes of dark and light. The weight is about 54 lb. per cubic foot. It is used for helves, walking sticks and mallets, and perhaps for furniture. The heartwood is used in tanning. The flowers are sometimes eaten in curries.

The tree is a native of South India, Burma, Malaya, and Siam. It is now grown throughout India and is very common in Calcutta, both in gardens and on roadsides. It grows quickly but is short-lived, and it should not be planted where falling boughs may cause damage, because during heavy rain its branches are liable to snap without warning owing to the weight of water on the leaves proving too much for the brittle wood of the thinner stems. For the same reason it is inadvisable to take shelter under one of these trees in a storm.

**Cassia glauca** Lam. *Syn.* Senna arborescens *Roxb.*

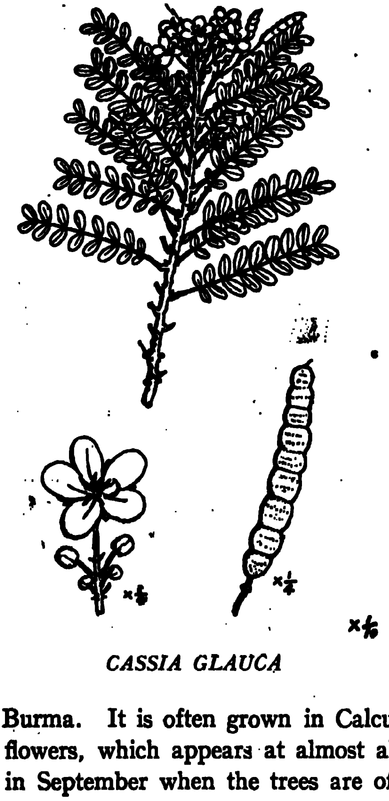
(Glauca means "grey-blue", or "sea-blue".)

(F.I. p. 352. F.B.I. Vol. II. p. 265. B.P. Vol. I. p. 437.)

Nearly glabrous ; leaves paripinnate, up to 10 inches long ; leaflets 6 to 18, elliptic-oblong or oblanceolate, obtuse or subacute, base rounded, glaucous beneath, up to 2 inches long, the lowest pair the smallest ; petiolules very short ; flowers yellow, up to 2 inches diam., in axillary racemes near ends of branchlets ; bracts reflexed ; petals 5, oblong, obtuse ; stamens 10, all perfect, the 2 lower with longer filaments ; pod thin, glabrous, dehiscent, 3 to 6 inches long.

This is a small tree or a large shrub often much branched from the base, having fairly smooth, greyish-brown bark covered with minute corky excrescences. The leaves are mostly grouped not far from the ends of the branchlets, and are divided into a number of rather broad leaflets, usually with rounded ends, set in opposite pairs on either side of a slender midrib ; those at the apex of the leaf are usually the largest, and the size diminishes progressively towards the base of the leaf. The leaflets are fairly bright green above but their undersides are glaucous or greyish in colour. The rather large flowers vary in colour from deep yellow to sulphur ;

they grow in a number of clusters set on stalks near the ends of the twigs, so that each twig appears to end in one large, broad cluster of bloom. Each flower has five broad, blunt petals, and ten short stamens, each with an anther containing pollen. The pods are flat and thin with wavy edges; they turn yellowish in colour when nearly ripe.



*CASSIA GLAUCA*

There are two fairly well defined varieties of this plant, one a small tree often with a single trunk, and the other a large shrub usually with a number of stems branching from the base. The latter variety, which is known as *"var-suffruticosa"* (i.e. shrubby), is much the commoner in Calcutta; all its parts are much smaller than the larger variety; but intermediate forms occur.

The bark of this tree mixed with sugar and water is used as a remedy for diabetes.

The tree is a native of Malaya, South India, and Burma. It is often grown in Calcutta gardens for its fine yellow flowers, which appears at almost all times of the year, especially in September when the trees are often heavily laden with bloom. By far the commonest variety is a shrubby form with bright yellow flowers.

**CYNOMETRA.** (From the Greek "kuon", a dog, and "metra", a womb). This is a genus of about 30 trees and shrubs, natives of the tropics, of which 5 are found in India. The leaves are usually arranged in opposite pairs, and divided into several leathery leaflets also set in opposite pairs. The flowers are small and numerous. The calyx has 4 or 5 segments, and there are 5 equal petals. The stamens number 10 or more, and the thick pods usually contain only one seed, and do not split open to release it (indehiscent).

In addition to the species described below, *Cynometra cauliflora* Linn. is occasionally grown in Indian gardens. This species has numerous pink flowers in short clusters on the trunk and thicker branches, and bears edible, succulent fruits, often near the ground. Its leaves have only one pair of leaflets.

**Cynometra polyandra** Roxb.

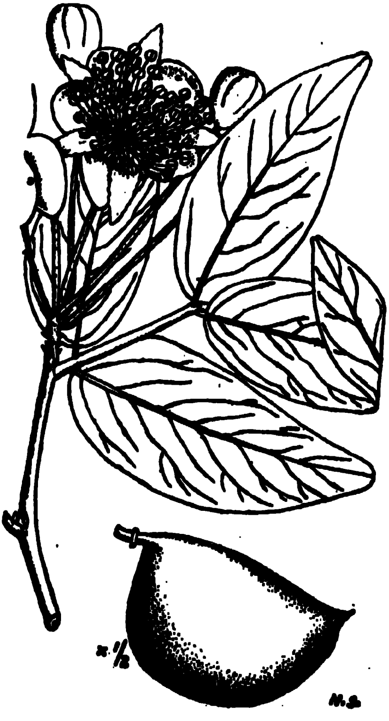
(Polyandra is Greek meaning "with many stamens".)

(F.I. p. 361. F.B.I. Vol. II. p. 268. B.P. Vol. I. p. 443.)

Leaves about 6 inches long, paripinnate; leaflets 4 or 6, opposite, glabrous, obliquely elliptic, sessile, about 3 inches long; flowers in axillary, sessile, corymbose racemes, white, often tinged with pink, ½ inch across; petals reflexed; stamens 40 to 60, much exserted; pod woody, 2 to 3 inches long, oblique-oblong.

This evergreen tree grows to a great height in its native home, but in lower Bengal it seems to attain only a small size. The leaf-buds are covered with large, rough and papery, sheathing scales, and the leaves are divided into two or three pairs of narrow, pointed, stiff and shining, leaflets set on opposite sides of a slender, brownish midrib. The rather small white or pinkish flowers grow in profusion in small broad clusters among the leaves. The most conspicuous part of the flower is the group of very numerous protruding stamens, an altogether exceptional occurrence in this family of plants. The pod is short, thick, and woody.

This tree is a native of Assam and Malaya. It is occasionally grown in Indian gardens for its fine dark green foliage, and for the multitude of small flowers which appear in February and March. A specimen may be seen in the south-west part of the Belvedere garden (in 1941).



*CYNOMETRA POLYANDRA*

**BAUHINEA.** (Named after John and Caspar Bauhin, two 16th century herbalists, who were twin brothers; the two leaflets united to form a single leaf suggested the two brothers united in the study of botany). This is a genus of about 150 trees, shrubs, and woody climbers, all natives of the tropics. The leaves consist of 2 leaflets which are usually joined to form a single leaf with two equal lobes at the apex. The 5 petals are slightly unequal. The stamens number 10 but of these some are usually sterile and smaller or minute, so that the flowers may appear to have any number of stamens from 1 to 10. The pods are thin and flat and contain numerous flat seeds.

About 20 species are natives of India, and in addition to the two trees described below, several other species are occasionally found in Bengal gardens. The best known of these is probably *B. acuminata* Linn., a shrub with showy white flowers each containing 10 fertile stamens. *B. Galpinii* N. E. Br. is a straggling shrub with small leaves and fine reddish-orange or crimson flowers. *B. sulphurea* is a tall shrub with pale yellow flowers, and *B. tomentosa* Linn., another shrub with yellow flowers, marked with a dark purple or red blotch at the base. *B. monandra* Kurz. is a small tree with pink flowers each containing a single fertile stamen, and *B. Vahlii* W. & A. is an immense climber with small creamy-white flowers. *B. Petersiana* is a large spreading shrub with pale yellow flowers and leaves less than one inch long.

**Bauhinea purpurea** Linn. *Syn.* B. triandra *Roxb.*

(Purpurea is Latin meaning "purple".)

| | |
|---|---|
| Bengali, | *devakanchan, kanchan, koiral, raktakanchan.* |
| Hindi, | *gairal, kaliar, kandan, khairwal, kachnar.* |
| English, | *geranium tree, camel's foot tree, mountain ebony, tree bean.* |

(F.I. p. 344. F.B.I. Vol. II. p. 284. B.P. Vol. I. p. 442.)

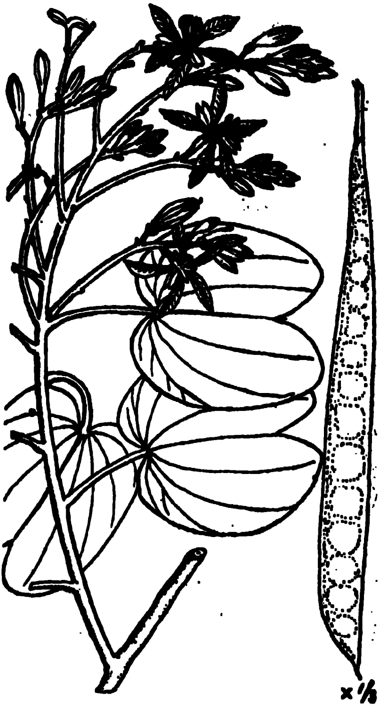
A medium-sized nearly evergreen tree; leaves subglabrous, scarcely glaucous, submembranous, cleft about half way down, 3 to 6 inches long, lobes often overlapping along the inner margins; nerves 9 to 11; racemes short, in terminal panicles; flower-buds acutely 5-angled; flowers 2 to 3 inches diam.; calyx tube obconical, ¼ inch long, limb ½ inch long, cleft to the base into 2 reflexed segments; petals oblanceolate; fertile stamens 3 or 4; pod 6 to 12 inches long, narrow below, broader upwards, flat, dehiscent with coriaceous, twisted valves.

This is an almost evergreen tree of moderate size, usually with a bushy habit of growth. Its bark is thick, nearly smooth, and ashy to dark brown in colour. The smooth, leathery leaves are rather longer than broad and cleft nearly half way from their apex into two rounded or pointed lobes, making the characteristic "camel-foot" leaf of the genus. The large and showy fragrant flowers are borne in small, loose clusters at the ends of the branches. The calyx consists of a short tube and two much longer reflexed segments, one notched at the tip, and the other with three teeth. There are five long, narrow, pointed petals, purple, white, or mauve in colour, the commonest variety having four white petals and a fifth white marked with purple. The fertile stamens number three, or occasionally four. The long, narrow and flat pods ultimately burst suddenly owing to the unequal tension on different parts of the two valves that results from drying, and scatter the seeds to a considerable distance from the tree, it is said to a distance of 15 yards or more.

The bark of this tree is occasionally employed for dyeing and tanning, and to yield a fibre. The flowers and buds are made into curries and pickles, and the leaves are given as fodder to cattle. The wood is fairly hard, and weighs about 45 lb. per cubic foot ; it is used for making implements and for house-building.

Medicinally the bark is employed as an astringent and to make a wash for ulcers. The flowers are laxative, and the bark mixed with the flowers is used to treat boils and abscesses. The bark of the root is said to be very poisonous, but the bark of the stems is said to be a remedy for diarrhoea.

The tree is a native of the foothills of the Himalayas and is common in the Terai. It now seems to be established in thickets and jungles in south-west Bengal, and is common in villages. It is not much grown in gardens, but may be found in some Calcutta compounds. A beautiful variety with deep cerise petals is sometimes grown ; it flowers in November and December, rather later than the commoner forms. Hindus regard the flowers of this and other species of *Bauhinea* as sacred to Krishna and the Saktis.



*BAUHINEA PURPUREA*

The flowers appear among the leaves in October and the early cold weather, and the pods ripen from January to March. Propagation is easily effected by seed. The scent of the flowers is very attractive to bees. The leaves fall in March and April, and the tree is almost bare of leaves for a short time.

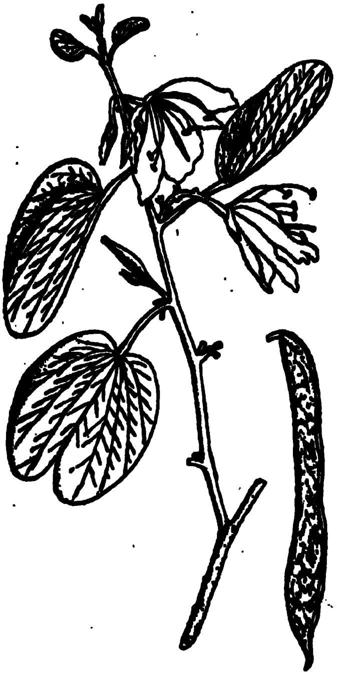
**Bauhinea variegata** Linn. *Syn*. B. candida *Roxb*.

(Variegata in Latin means "variegated", referring to the colouring of the flowers. Candida means "pure white".)

| | |
|---|---|
| Bengali, | *rakta kamhar, ṣwet kanchan* (according to the colour of the flowers). The white variety is also known as *kana raj*. |
| Hindi, | *kachnar, koliar, kural, padrian, khwairal, gurial, gwiar, barial, kandan.* |

(F.I. p. 344. F.B.I. Vol. II. p. 284. B.P. Vol. I. p. 442.)

A medium-sized deciduous tree; leaves usually rather broader than long, 11- to 15-nerved, lobes divided about ¼ the length of the leaf, subcoriaceous, grey-glaucous and pubescent, especially on the nerves beneath; flowers about 3 inches diam., in short, few-flowered racemes; calyx tube cylindric, as long as the ovate, spathaceous, 5-toothed limb; petals obovate or oblanceolate, up to 2 inches long, white, mauve, or purple; perfect stamens usually 5; pod 6 to 10 inches long, about 1 inch broad, hard, flat, glabrous, slightly curved; seeds 10 to 15.



*BAUHINEA VARIEGATA*

This is a small or middle-sized tree with a short trunk and dark brown, slightly rough bark. Its leaves consist of two leaflets joined for about three-quarters of their length, leaving two rounded lobes at the end of the leaf, as usual in plants of this genus. The nerves at the base of the leaf usually number more than nine, and the leaves are generally slightly broader than long. During the cold season the foliage falls, and from the end of January till March the large purple, pink, or white flowers appear among the falling leaves, until eventually they almost cover the otherwise bare branches, making this one of the most beautiful of all Indian trees. The flowers vary greatly in colour, but are never altogether of the same shade; the commonest varieties are one with purple petals, four being light purple and the fifth much darker; and another with four white petals and the fifth variegated with purple or with yellowish-green, the latter variety being sometimes referred to as *B. candida* Roxb. The petals are broader than those of *B. purpurea,* and the fertile stamens usually number five (rarely fewer). The pods are flat and slightly curved, containing ten to fifteen seeds; they burst elastically when ripe in order to scatter the seeds to a distance from the tree.

The wood is greyish-brown and fairly hard, its weight being about 44 lb. per cubic foot. It is made into agricultural implements and such-like articles. The leaves and flower-buds are eaten as a vegetable, and the flower-buds are pickled. The bark is used in dyeing and tanning, and to yield a useful fibre.

Medicinally the bark is employed as an astringent, and is prescribed for a wide variety of diseases, especially to cure asthma, wounds, and ulcers. The buds and roots are also used for a number of medicinal purposes, especially to cure various digestive troubles. The root is said to be of value in the treatment of snake-bite.

This very beautiful tree is a native of most of the dryer hilly parts of India. It is commonly planted in Calcutta gardens, where its brilliant flowers on the almost bare branches are a striking feature in spring, reminiscent of almond blossom when seen at a distance. In the wild state it is not found in lower Bengal, and is seldom seen to perfection owing to the damage done by the removal of its bark for medicinal and other purposes. It is easily propagated from seed, and blooms when only eight or ten feet high. The scent of the flowers is very attractive to bees.

### 3. MIMOSEAE.

This is the third sub-family of the *Leguminosae,* consisting of trees, shrubs, climbers, and a few herbs, all natives of the warmer parts of the world. The leaves are divided into separate leaflets, usually arranged on either side of branches of the midrib of the leaf (bipinnate), there being no terminal branch at the end of the midrib. The flowers are small and regular, i.e., the petals and other parts are equal and symmetrical, so that each flower is the same shape on all sides. The stamens number 8, or 10, or more, and usually project far beyond the petals so that they form the most conspicuous part of the flowers, which are usually crowded into compact spikes, or heads, and have a hairy or furry appearance owing to the many prominent stamens.

This sub-family takes its name from the genus *Mimosa* which contains about 300 species, mostly shrubs and herbs indigenous in America. In Bengal this genus is represented by *Mimosa pudica* Linn., the sensitive plant (Bengali, *lajuk*), a small prickly shrub with minute pink flowers in spherical heads, and leaves divided into many diminutive leaflets set on either side of 3 or 4 branches, which radiate from the end of the leaf-stalk (digitate); the leaves are highly sensitive to being touched and fold up suddenly and completely if disturbed. *Mimosa rubicaulis* Lam. (Bengali, *kuchi kanta,* or *shia kanta*), a large, straggling, prickly shrub with spherical heads of pink flowers, which fade to white, is not uncommon to the south of Calcutta in thickets and waste places.

**ADENANTHERA.** (Greek "aden", a gland, and "anthera", blooming, in allusion to the glands on the anthers). A genus of 4 species of erect trees, natives of tropical Asia and Australia. The leaves are divided into separate leaflets arranged on either side of branches of the midrib, the leaflets not being in opposite pairs (bipinnate with alternate leaflets). The minute flowers are borne in narrow spikes, each flower having 10 stamens bearing anthers tipped with very minute glands. The strap-shaped pods have 2 leathery valves which are much twisted after they open.

**Adenanthera pavonina** Linn.

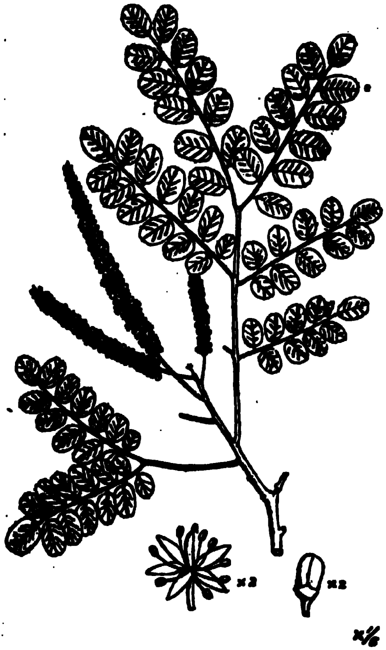
(Pavonina in Latin means "peacock-like", or "coloured".)

| | |
|---|---|
| Bengali, | *ranjana, raktakambal, rakta kanchan.* |
| Hindi, | *barigumchi, raktachandana.* |
| English, | *red sandalwood, bead tree, red wood, peacock tree, coral pea.* |

(F.I. p. 360. F.B.I. Vol. II. p. 287. B.P. Vol. I. p. 452.)

A deciduous unarmed tree; leaves bipinnate; pinnae opposite, 8 to 12, 4 to 8 inches long; leaflets 12 to 18, evenly alternate, elliptic-oblong, obtuse, ¾ to 1½ inches long; flowers yellowish, scented, about 1/6 inch long, in racemes 2 to 6 inches long by ½ inch broad; calyx campanulate, teeth short; petals 5, connate at the base; stamens 10, free, anthers gland-tipped; pod linear, curved and twisted when opening, falcate, 6 to 9 inches long; seeds 10 to 12, usually bright scarlet, rarely yellow-brown.

This is a large tree with rough, dark grey bark, and dark green leaves divided into a large number of blunt leaflets arranged on either side of branches from the midrib of the leaf. These branches (known as "pinnae") are set in opposite pairs in the usual way, but the leaflets have the peculiarity, unusual in leaves of this type, of being arranged alternately on opposite sides of the pinnae, and not in opposite pairs. The minute, creamy-yellow flowers are borne in long spikes, which spring singly from near the bases of the leaves, and are grouped in open clusters at the ends of the branches. Each flower has five minute petals spreading in the form of a star, and ten prominent stamens. The pods are long and narrow; their two leathery valves twist and bend as they open to display the most distinctive feature of the tree, namely the bright scarlet shining seeds, of which ten or twelve are usually found in each pod.



*ADENANTHERA PAVONINA*

The seeds are much used by jewellers and goldsmiths as measures of weight, because they are said very constantly to weigh precisely 4 grains each. They are also worn as ornaments and are often set in gold or other metals as jewellery, in Europe as well as in India. They are extremely hard and their beautiful scarlet colour is permanent unless the seeds are soaked in water. An oil is sometimes extracted from them, and they are also used, mixed with borax, to make a gum or adhesive paste.

The wood is hard and close-grained. The heartwood is of a handsome red colour which turns purple on exposure. It is hard and even-grained, and weighs about 55 lb. per cubic foot. It is used for building purposes and cabinet-making. It also yields a red dye which is valued for making marks of religious significance on the foreheads of Hindus.

Medicinally the powdered seeds are used for the treatment of wounds, and the leaves as a remedy for rheumatism and gout.

This tree is a native of China, Malaya, and most of the warmer parts of India, but is nowhere common in a wild state in this country. It is much planted in South India, but is rather rare in Bengal. A single specimen grows (in 1944) on the north side of Lower Circular Road against the Royal Calcutta Turf Club enclosures, not far from the Zeerut Bridge, and others grow in Camac Street and in Dalhousie Square.

The flowers mostly appear at the end of March and in April, when the tree is covered with new leaves, but some are also produced in September and October. The branches are more or less bare of leaves for a short time at the end of the cold season and the new leaves are produced in February and March. The fruits mostly ripen in the cold weather and the seeds continue to fall till well into the hot season when the new flowers have opened. The dispersal of the seeds is accomplished by birds, their brilliant colour being an adaptation to attract these visitors.

**LEUCENA.** (From the Greek "leukainein", to whiten). A genus of about 8 species of trees, mostly American. The leaves are divided into separate leaflets arranged on either side of branches of the midrib of the leaf (bipinnate). The small flowers are borne in dense spherical heads. The stamens number 10 in each flower; they are separate from one another and exserted far beyond the other parts of the flower. The pods are flat, strap-shaped, and leathery; they open along their edges to release the seeds (dehiscent), and are not jointed. The genus differs from *Mimosa* chiefly as regards the pods, which in the case of *Mimosa* are jointed between each seed and do not split open along the edges.

**Leucena glauca** Benth.

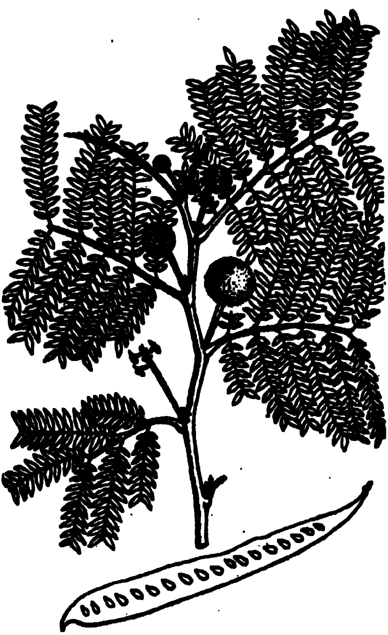
(Glauca is Latin meaning "grey-blue", or "sea-blue".)

English, *horse tamarind, white babool, lead tree.*

(F.B.I. Vol. II. p. 290. B.P. Vol. I. p. 455. Not in F.I.)

**A small spineless tree; leaves bipinnate, 3 to 7 inches long; pinnae 8 to 16, 1½ to 3 inches long; leaflets 20 to 30, linear, acute, membranous, caducous, glaucous, finely downy, about ⅓ inch long; flowers white or yellowish in dense globose heads; corolla ⅛ inch long; stamens 10, free, about ¼ inch long; heads short-peduncled, often in pairs, ½ to ¾ inch diam.; pod straight, flat, glabrous, 5 to 6 inches long by about ½ inch wide; seeds 15 to 20, lenticular, shining.**

This small tree has fairly smooth, light-brownish-grey bark, and slender branches, which usually spring from points not far above the ground. Its leaves are delicately divided into a large number of narrow, pointed leaflets, which are set on either side of branches from the midrib of the leaf. The leaflets are greyish or glaucous in colour and are covered with very fine down. Many minute white or yellowish flowers grow in dense spherical heads, each of which is borne on a short stalk that generally springs from the stem near the base of a leaf. Usually the heads grow in pairs, but sometimes singly. The long, narrow, flat pods are generally borne in large numbers near the ends of the branches, and contain a number of hard, shining seeds.



*LEUCENA GLAUCA*

The wood is white and hard, but does not grow large enough to make it of any value as timber. In some places the pods are used to make fancy baskets and ornaments. In Assam the bark is eaten to relieve internal pains, but the tree is generally believed to be therapeutically inert. The young fruits and seeds are said to be sometimes eaten with rice, and the leaves are used as fodder for animals.

Tropical America is the original home of this tree, but it is now naturalised in many tropical countries. In India it is commonly grown as an ornamental tree and as a shade tree for crops; it is often found growing as if wild and sometimes becomes a weed of cultivated lands. Near Calcutta it occurs near villages and in thickets. Several trees have been planted on the Tollygunge Golf Course.

The flowers appear mostly in March and April, and again from August to November. In the cold season the branches are usually heavily laden with the large brown pods.

**ACACIA.** (An ancient Greek name). This is a genus of about 450 species of trees, shrubs and climbers, often spiny, natives of warm countries, especially Australia. The leaves are usually bipinnate with small leaflets, i.e., they are divided into a number of small leaflets arranged in rows on either side of branches of the midrib of the leaf. But in some exotic species the leaves of mature plants are altogether wanting, and the leaf-stalks are expanded into leaf-like structures known as "phyllodes", which differ from the true leaves in their interior structure and in the arrangement of their nerves, which are parallel, instead of branched and reticulated as in the case of true leaves in this class of plants. The flowers are very small, usually yellow or white in colour, and closely joined in spherical heads, or cylindrical spikes. The calyx and corolla have four or five segments each, and the stamens are numerous and separate. The pods take various shapes but contain no pulp between the seeds.

In addition to the trees described, several other species occasionally occur in lower Bengal and may perhaps be found near Calcutta. *A. Catechu* Willd. (Bengali, *khayar*) is a tree closely resembling *A. Suma* Ham., but differing in having dark bark and more yellowish flowers. It is the principal source of "cutch", a valuable dyeing and preserving agent, and "katha", an astringent substance much used in India for eating with *pan*. It is of great importance in some parts of India as the source of these products and is occasionally planted in Bengal. *A. tomentosa* Willd., (Bengali, *salsain babul*) is a small thorny tree with leaves not unlike those of *A. arabica* Willd., but with purplish flowers; it is said to occur in village shrubberies in lower Bengal. *A. concinna* DC. is a prickly climbing shrub with downy branches and small heads of yellow flowers, which is sometimes used for making hedges in Bengal. In all, about 20 species are indigenous in India and several exotic species are cultivated.

### **Acacia moniliformis** Griseb.

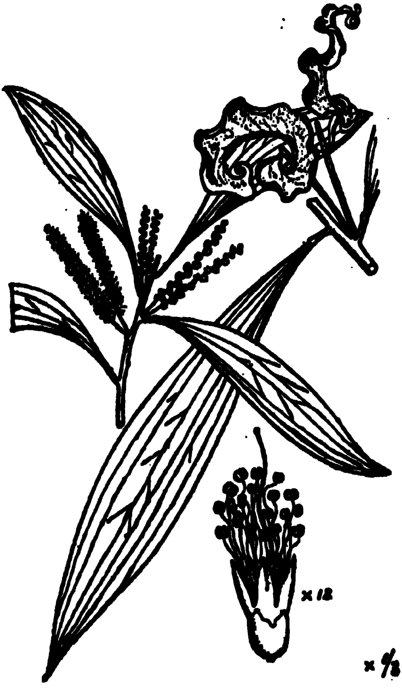
(Moniliformis means "necklace-shaped", or "like a string of beads", presumably with reference to the arrangements of the flowers in spikes, or perhaps more probably to the seeds, which hang like little pendants on golden threads.)

(Not in F. I., F.B.I., and B.P.)

A medium-sized, evergreen, glabrous tree; leaves wanting; phyllodes subcoriaceous, semilunate or sickle-shaped, or obliquely elliptic, obtuse, tapered to each end, up to 8 inches by 3 inches, nerves parallel; petiole up to 1 inch long; flowers yellow, scented, sessile, in dense rigid spikes near ends of branches; spikes up to 3½ inches long; corolla about 1/16 inch long; stamens ⅛ inch long; pod much twisted, margins undulate, ¼ inch wide; seeds black, funicle orange.

This is a moderate-sized tree with rather rough, greyish-brown bark, a slender trunk, and more or less drooping branches. Its evergreen foliage consists of long, narrow, curved "leaves" of a bright green colour and a rather leathery texture, set on short stalks, which are scattered along the slender twigs that hang from the ends of the branches. The minute, yellow, scented flowers grow in small, stiff spikes among the "leaves" near the ends of the twigs. The pods are pale green when young and brown when ripe ; they are much twisted and distorted, and often form several complete coils. When they split open, the shining black seeds hang for a time from the brown husks of the pods on curved, orange-coloured threads.

In common with a number of other Australian members of this genus, this plant strictly speaking has no leaves when mature, the so called "leaves" being actually leaf-stalks modified and flattened to form leaf-like structures, which are correctly known as "phyllodes". The nerves of these phyllodes all run parallel to one another from the base of the phyllode to the tip, a peculiarity which shows a fundamental difference between the structure of the phyllodes, and the ordinary leaves of this class of plants, which always have branching and reticulated nerves. But seedling plants have small bipinnate leaves, in structure like those of most other members of the family.



*ACACIA MONILIFORMIS*

This tree is a native of tropical Australia, and has only been introduced into India within recent years. It is now common in Bengal gardens, where it is much admired for its graceful, drooping, evergreen foliage, and fragrant yellow flowers borne profusely in neat spikes. The flowers appear at intervals throughout the year from March to December, but the biggest flush of bloom occurs in September and October. The pods mostly ripen in February and March, but at other times also. Propagation is easily effected from seed.

Two distinct varieties of this tree are found in Calcutta. The commoner of the two has more or less sickle-shaped phyllodes not more than two inches wide, and usually at least four times as long as broad; its flower-spikes are generally only about two inches long. The less common variety (which may prove to be a separate species), has much broader phyllodes, which are less than three times as long as broad, flower-spikes up to 3½ inches long, and tightly twisted pods, which form a close coil. (The latter plant has been incorrectly called *A. auriculiformis A.* Cumm, but this is the name of another species with narrow phyllodes and whitish flowers, which is fairly commonly planted in parts of Behar.) The commoner narrow-leaved variety has several forms, some of which have more drooping branches than others.

**Acacia Suma** Buch-Ham. *Syn.* Mimosa Suma *Roxb.*
(Suma is an Indian vernacular name).
Bengali, *saikanta, sau kanta.*
(F.I. p. 423. F.B.I. Vol. II. p. 294. B.I. p. 458.)

A large or middle-sized thorny tree; bark white; branchlets and petioles grey-pubescent; leaves bipinnate, about 6 inches long; common petiole 4 to 10 inches long; pinnae 20 to 40, 1¼ to 2 inches long; leaflets pale green, very crowded, 30 to 100, linear, imbricate, often ciliate, less than ⅛ inch long; flowers minute, white or pale yellow, in lax spikes 3 to 4 inches long; corolla not much exceeding the calyx; spikes up to 4 together; pod 3 to 5 inches long by ¾ inch wide, flat, pubescent when young.

This tree has conspicuous, whitish bark, stiff branches and twigs covered with soft grey down. Each leaf is divided into as many as 4,000 very small, narrow, pale green leaflets, which are crowded in rows on either side of numerous branches of the midrib of the leaf. The branches are armed with pairs of spines, which are borne near the bases of the leaves. Many minute, whitish flowers grow in narrow, cylindrical, drooping spikes, which usually spring in small clusters from the axils of the leaves near the ends of the twigs. The pod is flat and smooth, tapering towards the base into a short stalk.

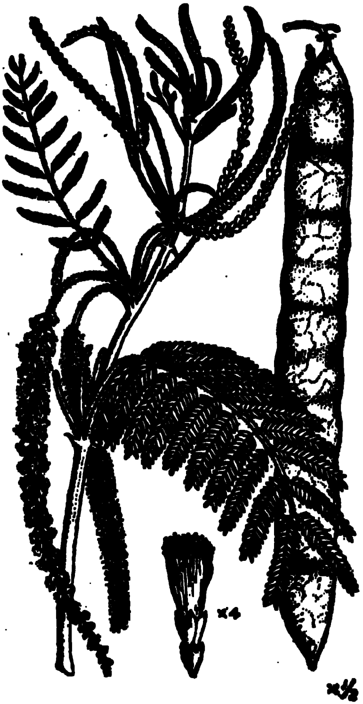
This tree closely resembles *Acacia Catechu* Willd. (Bengali, *khayar*), a tree of great importance in some parts of India, but may be distinguished by its whitish bark and whiter flowers. It is a native of most of the hotter parts of India including lower

Bengal, and is not uncommon in thickets on the south of Calcutta. Some trees grow near the third tee on the Tollygunge Golf Course.

Like *Acacia Catechu*, this species yields "cutch", a dyeing and preserving agent of great commercial importance, but the tree seems to be little utilised for this purpose. The wood is very hard, close-grained, smooth and heavy, weighing as much as 76 lb. per cubic foot, but it appears to be seldom used. The bark is employed medicinally as an astringent.

The flowers appear from May to October. Hindus use both the flowers and the leaves in the Durga Puja and to propitiate the presiding deities of the planets.

*A. Catechu* is common in the dryer parts of India, but does not seem to be found in south-western Bengal. It may be distinguished from *A. Suma* by its black bark, yellowish flowers, and its corolla nearly twice as long as the calyx.



*ACACIA SUMA*

**Acacia arabica** Willd. *Syn*. Mimosa arabica *Lam*.

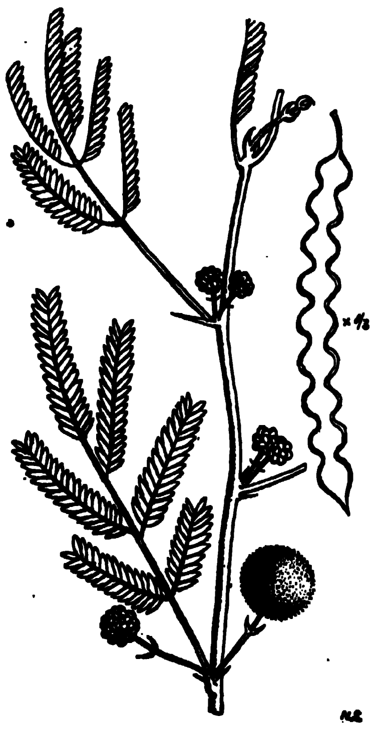
(Arabica means "of Arabia".)

| | |
|---|---|
| Bengali, | *babul, babla.* |
| Hindi, | *babul, kikar, babur.* |
| English, | *black babool, Indian gum-arabic tree.* |

(F.I. p. 421. F.B.I. Vol. II. p. 293. B.P. Vol. I. p. 458.)

A shrub or tree; trunk attaining 4½ feet girth; branchlets almost straight, grey-downy, armed with straight, white stipular spines up to 2 inches long; leaves bipinnate, pinnae, 6-12, ½ to 1½ inches long; leaflets 20 to 40, linear, glabrous or downy, ⅛ to ¼ inch long; flowers minute, yellow, in globose heads ½ inch diam.; peduncles fascicled; pod solitary, moniliform, much contracted between the seeds, 8- to 12-seeded, 3 to 6 inches long by about ½ inch thick, whitish-tomentose.

This is a thorny shrub, or a tree which sometimes attains a considerable size. Its bark is dark brown and rough, with rather deep longitudinal fissures. The trunk usually forks near its base, and its limbs are studded with many small branches and twigs. The branches are almost straight and the smaller twigs are covered with fine greyish down. The rather small, greyish- or bluish-green leaves are divided into a large number of narrow, almost minute, leaflets closely arranged in rows on either side of branches of the central midrib. Each leaf is usually accompanied by a pair of sharp spines. The spherical heads of minute yellow flowers are borne on the ends of slender stalks, which spring in small clusters from the axils of the leaves. The pods are produced singly, scattered along the branches; they are long and more or less round in section, but there is a very marked contraction between each seed giving the pod the outline of a string of beads. The tree may be easily known from its near relative, *Vachellia Farnesiana,* by its scentless flowers, almost straight twigs, and by the peculiar constriction of the pod between each seed.



*ACACIA ARABICA*

The babool is one of the commonest and most widespread of Indian trees and is of considerable economic importance in many places. The wood, which is hard, heavy and durable, weighing about 54 lb. per cubic foot, is much used for wheels, well-curbs, sugar- and oil-presses, agricultural implements, tool handles, boat building, and occasionally railway sleepers; it is also an excellent fuel but is said to injure the boilers in which it is burnt. A gum, similar to gum-arabic, extracted from this tree is employed in dyeing and cloth-printing. The bark is a powerful astringent and is collected for tanning; a decoction of it is also used as a substitute for soap. The pods, when unripe, are also astringent, and are made into a decoction for use as a gargle or lotion. Ink is made from the unripe pods, and they are often given as fodder to cattle, sheep, and goats. The branches and leaves are also used as fodder, and the thorny branches to make fences.

The leaves and bark are employed medicinally for a number of purposes, especially as tonics, and to cure sore eyes. The gum is also valued as a tonic and as a remedy for sore throats, coughs, lung troubles and burns. The flowers are said to be a cure for insanity, and the powdered bark is sometimes dusted over the bitten part in cases of snake-bite.

A sweetmeat is sometimes made by frying the gum with butter and spices, and making it into balls with sugar. In times of scarcity the bark is ground and mixed with flour. The bark of the root is said to be used in the preparation of country spirit. The slender spines make an excellent substitute for ordinary household pins.

The babool is believed to be indigenous in most of the dryer and hotter parts of India as well as in Arabia and Africa. In some parts of India it forms dense forests and is common in most places as a tree of cultivated land. Near Calcutta it is plentiful and one of the best known of the local trees. In some parts of India and other countries remarkable varieties are found, but the trees in Bengal seem to be all of the typical form.

The flowers are borne mostly during the rains and the cold season. The seeds often lie dormant for several seasons before germinating. The pods are eaten by animals, which so help to distribute the seeds and assist their germination by fermentation and moistening.

**VACHELLIA.** (A name commemorating the Rev. C. H. Vachel, an English collector and missionary in China). A genus containing a single species formerly included in *Acacia*, from which it differs principally in its pod, which contains 2 rows of seeds embedded in pulp.

**Vachellia Farnesiana** (L.) W. & A. *Syn.* Acacia Farnesiana *Willd.*
Mimosa Farnesiana *Roxb.*

(Farnesiana is a name given in honour of Cardinal Farnese, a horticulturalist, 1578 to 1592).

| | |
|---|---|
| Bengali, | *guhiya babul.* |
| Hindi, | *wilayati kikar, wilayati babul, pissi babul, gukikat, gandbabul, deb babul.* |
| English, | *cassie, sponge tree, scented babool, opoponax, West Indian blackthorn.* |

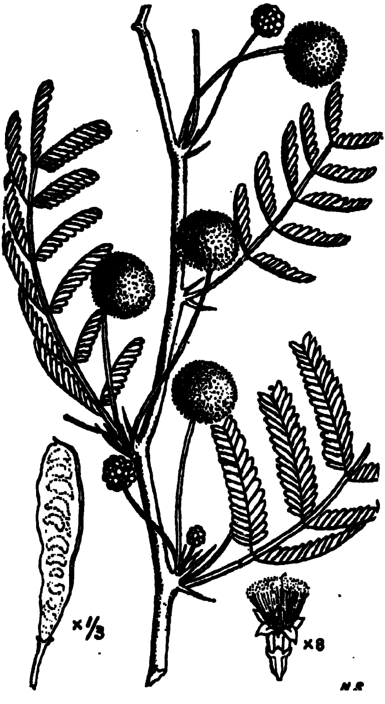
(F.I. p. 421. F.B.I. Vol. II. p. 292. B.P. Vol. I. p. 458.)

A thorny shrub or small tree; branchlets zig-zag, armed with straight stipular spines; leaves bipinnate; pinnae 6 to 16, 1 to 1½ inches long, opposite; leaflets 20 to 40, 1/6 inch long, rigidly coriaceous; flowers bright yellow, minute, sweet-scented, in globose heads about ½ inch

**diam.; pod turgid, pointed at both ends, glabrous, dull brown, striated, 2 to 3 inches long by about ½ inch thick.**

This is a thorny shrub, or small tree, with rough brown bark and conspicuously zig-zag twigs usually bearing a leaf and a spine at each angle. The rather small leaves are divided into a great number of diminutive leaflets, which are closely set on either side of branches from the central midrib, the branches (or "pinnae") being arranged in opposite pairs. Many minute, bright yellow flowers grow in small spherical heads borne on short stalks from a number of points scattered along the branches. The dull brown pods are not flattened and contain several seeds embedded in a pulpy substance.

When grown by itself in the open, this little tree adopts a neat, umbrella-like shape, but in other respects it is insignificant, and even rather unsightly, when not in flower. However, its flowers are often borne in great profusion, and it then becomes one of the most attractive of trees. Moreover the flowers have a sweet aromatic scent, reminiscent of wall-flowers, which sometimes carries to a great distance from the tree. The blooms appear at most times of the year including the cold season, when they are usually at their best. If severely pruned this plant makes an excellent thorny hedge, and it is much used for this purpose in the dryer parts of India. In Bengal it probably will not stand enough pruning to serve in this way, but it is often planted for ornament in gardens, and sometimes occurs as if wild in the neighbourhood of Calcutta. The flowers are much used by Hindus in religious ceremonies.



*VACHELLIA FARNESIANA*

A perfume known as "cassie" is extracted from the flowers, and the tree is cultivated for this purpose in the south of France. A gum is sometimes obtained from the stems. The wood is hard, close-grained, and heavy, but is too small to use for most purposes. The freshly felled wood has a peculiar and rather offensive odour, and the roots smell of garlic.

The bark is astringent, and is used medicinally for a wide variety of purposes, especially the cure of various internal disorders, and of ulcers. The plant is also believed by some to be of value in the treatment of snake-bite. An infusion of the flowers and leaves is given after childbirth.

America is believed to be the native habitat of this tree, but it is now found throughout the tropics, usually planted.

This species may be easily distinguished from the very similar and much commoner tree, *Acacia arabica,* by its zig-zag twigs and scented flowers.

**ALBIZZIA.** (Named after F. del Albizzi, an 18th century Italian botanist). A genus of about 50 species of large trees, all natives of the tropics of the Old World. The leaves are divided into separate leaflets arranged on either side of branches of the central midrib of the leaf (bipinnate). The small white, yellow, or pink flowers are arranged in spherical heads. The stamens of each flower are numerous, and are exserted far beyond the petals, but are joined together near their base, or for a large part of their length. The pods are flat, straight, and thin.

**Albizzia lucida** Benth. *Syn.* Mimosa lucida *Roxb.*

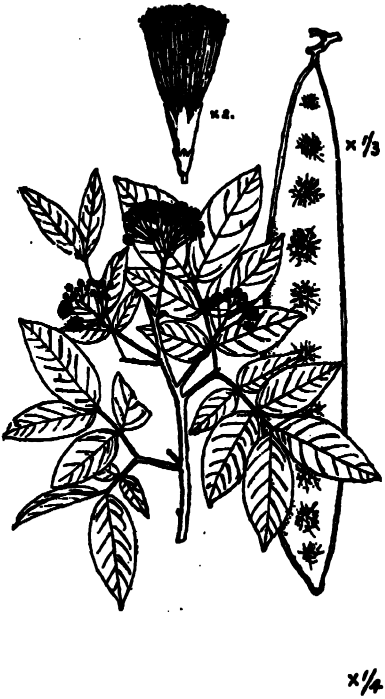
(Lucida is Latin meaning "shining" or "glistening".)

Bengali, *sil koroi.*

(F.I. p. 417. F.B.I. Vol. II. p. 299. B.P. Vol. I. p. 461.)

A large glabrous tree; leaves bipinnate; pinnae 2, or occasionally 4; leaflets 4, or sometimes 6, elliptic, acuminate, shining, 2 or 4 inches long, bright green, the lower pair, or pairs, much smaller than the terminal; flowers sessile in heads of 6 to 10 flowers which are copiously panicled; corolla 3 to 4 times as long as the calyx, teeth lanceolate; pod 6 to 8 inches long by about 1¼ inches wide, thin, flexible, pale brown; seeds 6 to 8.

This is a large and handsome tree with nearly smooth, brown bark, and a full crown of dark foliage. Its leaves are divided into several bright green, narrow, pointed, shining leaflets, which usually number eight or twelve a leaf. The midrib of the leaf has two, or sometimes four, branches set in opposite pairs, and each branch bears four or six leaflets, of which the two outer are always much larger than the others. Among the leaves the minute whitish flowers grow in a great profusion of small spherical heads. The pale brown, flat, thin and flexible pods contain six to eight seeds, the number of which can easily be seen from the outside of the pod.



*ALBIZZIA LUCIDA*

The wood is very hard and good, but is seldom used. It weighs about 55 lb. per cubic foot. Lac is obtained from the tree in Assam.

This species is a native of the lower hills of the Himalayas, Assam, Burma, and Malaya. It is occasionally planted near Calcutta, and is said to be self-sown in village shrubberies. A fine specimen may be seen on the north side of the Zoological Gardens (in 1941).

The flowers appear from April to September, and the pods ripen during the following cold and hot seasons. The new leaves are produced from April to June and are often reddish in colour.

**Albizzia procera** Benth. *Syn.* Mimosa elata *Roxb.*

(Procera and elata are both Latin meaning "tall".)

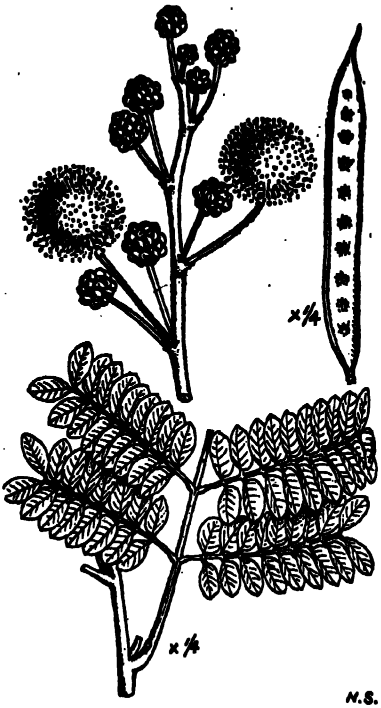
| | |
|---|---|
| Bengali, | *koroi.* |
| Hindi, | *karhar, gurar, safed siris, karo, karanji, gurkur, kalsis, baro, garso.* |
| English, | *white siris.* |

(F.I. p. 418. F.B.I. Vol. II. p. 299. B.P. Vol. I. p. 461.)

A large deciduous tree; leaves bipinnate; pinnae 4 to 12; leaflets rigidly subcoriaceous, glabrous, greyish beneath, obliquely oblong-ovate, ¾ to 2 inches long, 12 to 20; flowers minute, whitish, in small, few-flowered globose heads forming ample deltoid terminal panicles; corolla greenish white, campanulate, 5 times longer than the calyx; anthers yellow; pods 6 to 8 inches long by 1 inch broad, thin, brown; seeds 8 to 12.

This is a large tree with a long clean bole branching at a fair height to form a light crown. Its bark is whitish or pale grey, and is marked with horizontal lines. The leaves are divided into a number of unequal-sided leaflets, bright green above and pale beneath, set on either side of branches of the midrib of the leaf. A great profusion of minute, whitish flowers is borne in small spherical heads, which form large open clusters at the ends of the branches. The pod is thin, rather narrow, flat, and brown when ripe.

The white siris is indigenous in the lower hills of the Himalayas, and in many of the dryer parts of India including some districts of Bengal. It is not a native of the country round Calcutta, but is occasionally planted there and is said to be naturalised in village shrubberies, though it is certainly not common.



*ALBIZZIA PROCERA*

This tree is a well-known and conspicuous tree of many Indian forests and is of considerable economic importance. Its growth is very rapid, and the wood is of good quality, being straight grained, hard, and durable. Its weight is about 40 lb. per cubic foot. It is used for making implements, wheels, bridges, and house-posts, as well as for boxes, and charcoal, for which latter purpose it is specially good.

The leaves are valued as an insecticide, and medicinally for the treatment of ulcers. The bark is said by some to be a strong poison, but other authorities say that in times of scarcity it has been mixed with flour and used as food.

The flowers appear from May to September. The tree is seldom quite leafless, and the leaves are renewed in the hot season, at which time the pods ripen and fall. In its native forests the tree is usually found growing on riverbanks and in wet places.

**Albizzia Lebbek** Benth. *Syn.* Mimosa Sirissa *Roxb.*
(Lebbek is an Arabic name.)

Bengali, *sirissa, siris.*
Hindi, *siris, sirsa, garso, kalshish, lasrin, mathirshi, sirai, sirar, sirin, tantia.*
English, *siris, black siris, sizzling tree, fry-wood tree, parrot tree, woman's tongue.*

(Most of the English names are in allusion to the crisp rustling noise made by the ripe pods in the wind. The name *siris* is also given to several other species.)

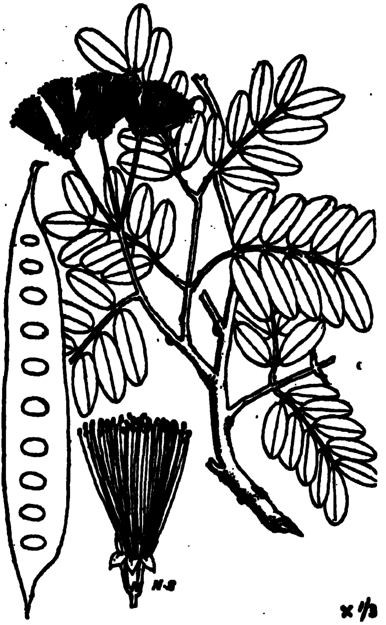
(F.I. p. 417. F.B.I. Vol. II. p. 298. B.P. Vol. I. p. 461.)

A large deciduous tree, nearly glabrous; leaves bipinnate; pinnae 4 to 8, 4 to 5 inches long; leaflets 10 to 16 or more, 1 to 1½ inches long, obliquely oblong, obtuse, pale green; flower-heads large, whitish, fragrant, 3 to 4 together on stout axillary peduncles 2 to 4 inches long; flowers pedicelled, 1½ inches long to the end of the prominent stamens, scented; corolla twice the length of the calyx; pod thin, dehiscent, straw-coloured when ripe, 8 to 12 inches long by about 1½ inches wide.

This large tree has spreading branches, and brownish-grey bark, rough with numerous short cracks. Its leaves are divided into a number of pale green, blunt, unequal-sided leaflets, which grow in rows on either side of several branches of the leaf's midrib. The sweet-scented flowers are much larger than those of most other trees in this genus, and are set in broad, many-flowered heads, which grow in small clusters from the axils of the leaves near the ends of the branches. The very numerous greenish-white stamens are exserted far beyond the other parts of the flower, and form the conspicuous part of the blooms. The pods are long, narrow, thin, and straw-coloured when ripe.

The siris, though not very abundant in lower Bengal, is one of the best known of Indian trees, for it is common in forests all over the country, and is often planted in avenues. The greenish-white flowers are not beautiful, but their sweet scent travels to a considerable distance, especially at night. The flowers appear during the hot season and the early part of the rains, and the leaves fall at the end of the cold weather, so that in February and early March the tree is more or less covered with the large straw-coloured pods, which sometimes make it a very conspicuous object, clearly visible a mile away or more. The pods then fall and are soon replaced by the new leaves and flowers. The roots do not penetrate deeply into the soil, and for this reason the tree is not very suitable for planting on roadsides in Bengal owing to its liability to fall in high winds. It is said to be very injurious to other plants growing near it, and is therefore seldom seen in gardens. It grows easily from cuttings.

The wood is hard, seasons well, and is fairly durable, but it varies greatly in quality. The weight averages about 50 lb. per cubic foot. It is used for building, sugarcane crushers, wheels, furniture, and similar purposes, and is exported to Europe under the name of "East Indian walnut."



*ALBIZZIA LEBBEK*

The leaves and twigs are excellent fodder for camels, and the tree is grown for this purpose in some countries.

Medicinally the tree has a large number of uses. The root is astringent and is a remedy for eye troubles and headache. The bark is used to cure skin diseases, bronchitis, and toothache, and is also considered a good remedy for rat-bite. The leaves are said to be good for eye troubles, and especially for night-blindness. All parts of the tree are used to treat the bites of venomous animals. Hindus value the flowers for religious ceremonies.

The tree is found in most of the hotter parts of India, Ceylon, Burma, Malaya and China, and is cultivated in various parts of Africa and America, but its original habitat is unknown. It is grown near villages and on roadsides in the neighbourhood of Calcutta, but is not common in the town itself. Several specimens may be seen on the Maidan near the east side of Fort William.

**Albizzia Richardiana** King & Prain.

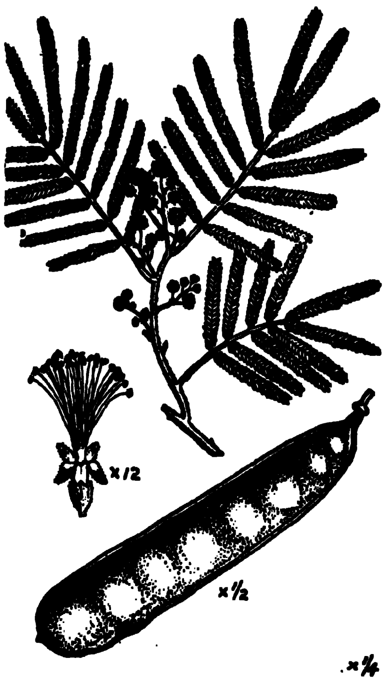
(Richardiana is a name given in honour of Mons. Richard of Madagascar, who sent the seeds of this tree to the Royal Botanic Gardens, Calcutta, in 1841).

Bengali, *belati amluki*.

(Not described in F.B.I., and F.I. B.P. Vol. I. p. 460.)

A lofty tree; leaves bipinnate, 2¼ to 3½ inches long; pinnae 10 to 14; leaflets 50 to 100, linear, crowded, about ¼ inch long; flowers minute, whitish, in many-flowered heads; heads in small panicles much shorter than the leaves; filaments 25 to 30; pod about 4 inches long by 4/5 inch wide, thin, firm, strap-shaped, dull brownish-grey; seeds 8 to 12.

This is a lofty, quick-growing tree with fairly smooth, pale, greyish bark, and a very distinctive and beautiful habit of growth. The trunk sometimes branches from near the base, but more often is tall and straight with no branches for a long distance from the ground. The tendency is for the trunk to fork into two equal limbs, each of which again branches into two, and so on, until the smallest twigs are reached. This tendency is not always strictly followed, but in any case the slender branches invariably rise almost vertically upwards from the base and spread gradually and gracefuly outwards, giving the tree a stately and unique appearance. The small, feathery leaves are borne only near the tips of the twigs, and the beautiful arrangements of the branches can therefore be clearly seen. Each leaf is divided into a multitude of diminutive, narrow leaflets closely set in rows on either side of a number of divisions of the leaf's midrib, *i.e.*, pinnae. The minute, whitish flowers grow in small spherical heads, which are borne in short, open clusters at the bases of the leaves, and are largely concealed by the foliage. The brownish grey pods are firm and flat.



*ALBIZZIA RICHARDIANA*

The flowers of this tree are altogether insignificant, but nevertheless it may be considered one of the most beautiful trees to be found in Calcutta owing to the graceful way in which the light foliage is borne on the tips of long, slender, almost erect branches. Grass and other plants grow well beneath its scanty shade, and it is undoubtedly one of the best of garden trees.

The seeds of this species were sent in 1841 by a Monsieur Richard of Madagascar to the Royal Botanic Gardens, Calcutta, where it has been grown ever since. For some years the origin of the tree was forgotten and several names were given to it by different authorities, but the matter was cleared up about the year 1901 by Sir George King and Sir David Prain, who are the authorities for its present name.

The tree is now planted in several public gardens in Calcutta, and elsewhere. A magnificent specimen, probably an offspring of one of the original seeds, is to be seen in the Royal Botanic Gardens, and a fine tree grows near the main gate of the Zoological Gardens (1944).

The flowers appear towards the end of the rains. The leaves usually fall at the end of the cold season, and are replaced during the early part of the hot weather.

**PITHECOLOBIUM.** (From the Greek "pithekos", an ape, and "lobos", a pod). A genus of about 100 species of trees and shrubs, natives of the tropics, chiefly American. The leaves are divided into separate leaflets arranged on either side of branches from the midrib of the leaf (bipinnate). The small flowers are joined in heads or spikes. The stamens of each flower are numerous and prominent, but are joined near their base. The pods are leathery, and curved or twisted in shape; they split open to release the seeds (dehiscent).

**Pithecolobium dulce** Benth. *Syn.* Mimosa dulcis *Roxb.* Inga dulcis *Willd.*

(Dulce is Latin meaning "sweet", in allusion to the edible pulp of the pod).

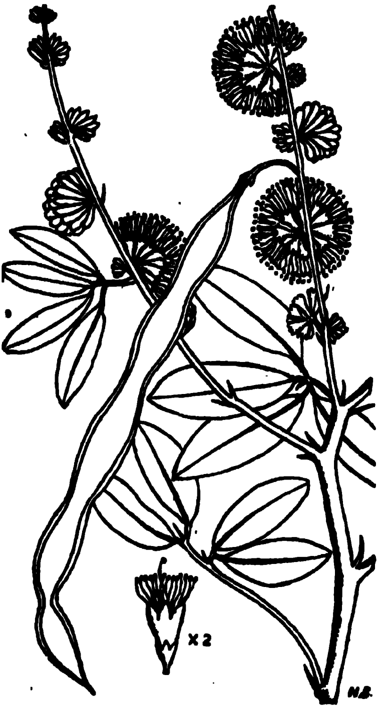
| | |
|---|---|
| Bengali, | *belati amli, dekhani babul.* |
| Hindi, | *bilayati imli, dakhani babul.* |
| English, | *Madras thorn, Manilla tamarind, guaymochil, karkapilly* (from the Tamil name). |

(F.I. p. 421. F.B.I. Vol. II. p. 302. B.P. Vol. I. p. 462.)

A glabrous, evergreen tree or shrub with small stipular spines pointing upwards; leaves bipinnate; pinnae 2; leaflets 2, pale green, coriaceous, oblique, obovate-oblong, usually obtuse, 1 to 2 inches long; common and partial rachis slender, terminating in bristles; flowers white, in small globose heads arranged in long, narrow, terminal panicles; flowers sessile; heads about ½ inch broad; style filiform, pink; pod linear, coriaceous, twisted, 4 to 5 inches long; seeds 6 to 8.

This is a large evergreen tree with grey bark and a rather shapeless habit of growth, the trunk often being crooked, marked with horizontal weals, and with small branches springing from near its base. The plant may also be found growing as a shrub in thickets and hedges. The branchlets are armed with short, sharp spines which grow near the base of the leaves and point upwards towards the ends of the twigs. The leaves are "bipinnate," as are those of all members of this genus, but in this case they take the simplest possible form, i.e., the midrib of the leaf has two opposite branches (pinnae), each of which bears two opposite leaflets, making in all four leaflets to each leaf. Each leaflet is leathery in texture, pale greyish-green in colour, and in shape blunt and unequal-seeded. At a short distance the leaflets may appear to be separate leaves, and the tree may easily be recognised by the characteristic look of its thinly scattered foliage. The minute, dull white flowers are borne in a profusion of small spherical heads which grow in long, narrow clusters at the ends of the twigs. The slender, leathery, twisted pods contain six to eight seeds embedded in a sweetish edible pulp.

This is a very useful and hardy tree, a native of South America but now common in most of the hotter parts of India, specially in Madras. It is much grown to form hedges, for which purpose it is very suitable as it stands any amount of pruning, or nibbling by animals, and its thorns make it a formidable barrier. The fruits are eaten by poorer people, the pulp being wholesome and nourishing. The pods and leaves are useful fodder for sheep, goats, horses and cattle. The timber is of fair quality and weighs about 40 lb. per cubic foot; it is used for making carts, packing boxes, and for panelling. The tree grows very rapidly and in some places is planted for fuel, especially for firing bricks.



*PITHECOLOBIUM DULCE*

The bark is sometimes used medicinally as a febrifuge.

The tree is common in the neighbourhood of Calcutta, and occasionally attains a good height, though it is more often found growing as a hedge or shrub.

The flowers appear from January to April. The young leaves are mostly produced about January, when they are often copper-coloured. The fruits ripen from April to July.

**ENTEROLOBIUM.** (From the Greek "enteron", intestines, and "lobos", a pod, in allusion to the structure of the fruit). A genus of about 40 species of large trees, natives of the tropics of America. The leaves are divided into separate leaflets set on either side of lateral branches of the midrib of the leaf (bipinnate). The numerous small flowers grow in round heads, which are solitary or arranged in small groups. The stamens are pink, purple, or white, very numerous, much exserted, and joined together near their bases. The pods are straight, strap-shaped, only partially flattened, and divided by partitions between the seeds. The genus used to be included in *Pithecolobium*, from which it is distinguished principally by the form of the pods, which in *Pithecolobium* are spirally twisted. Some authorities have placed those species with pods which are divided by partitions between the seeds and do not split apart to release the seeds, in a separate genus, *Samanea*.

**Enterolobium Saman** Prain. *Syn* Pithecolobium Saman *Benth.* Mimosa Saman *Jacq.* Samanea Saman *Merrill.*

(Saman is an American vernacular name.)

| | |
|---|---|
| Bengali, | *belati siris.* |
| English, | *rain tree, guango, saman.* |

(Not in F.I. & F.B.I. B.P. Vol. I. p. 463.)

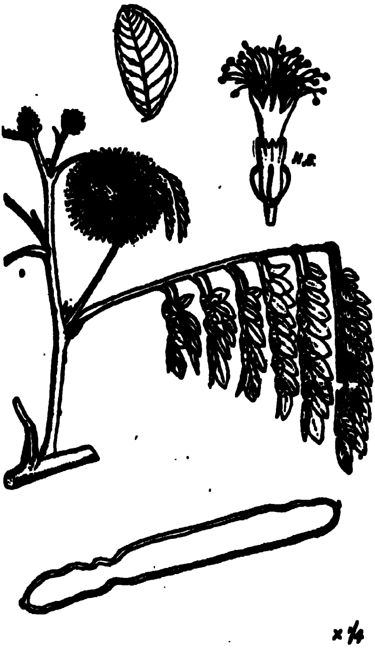
A large deciduous tree ; leaves bipinnate, up to 15 inches long, puberulous ; pinnae usually 12, up to 8 inches long, the outer the largest ; main and secondary rachis swollen at base ; leaflets up to 16, opposite, oblique, ovate-oblong, obtuse, shining above, up to 1½ inches long ; flowers in solitary globose heads up to 2 inches diam.; peduncles 4 to 5 inches long ; corolla ½ inch long, yellowish, silky ; stamens 20, pink, far exserted ; pod sessile, straight, glabrous, 6 to 8 inches long by ½ to 1 inch broad, septate, indehiscent.

This is a very handsome quick-growing tree of great size, with rough dark-grey bark, a thick short bole, and very wide-spreading limbs. The dark-green leaves are divided into a number of blunt leaflets set on either side of branches from the central midrib of the leaf. They show a characteristic not unusual in this family of plants, namely in wet weather and at night the leaflets, and the leaves themselves, fold downwards, while by day in fine weather they open widely to catch the greatest possible amount of sunlight. Many small pink flowers are grouped in conspicuous round heads, the numerous rose-coloured stamens, which project far beyond the rest of the flower, being the showy part of the blooms. The pods are narrow, straight and flattened ; they contain several seeds embedded in pulp, each separated by a transverse partition of the pod.

This magnificent species is a native of Brazil, but is now cultivated in many parts of India as an ornamental shade tree, and for its attractive pink flowers. It grows at a remarkable speed and soon covers a wide area with its low, spreading limbs, but after forty or fifty years it becomes top-heavy and is then inclined to be dangerous. The roots spread widely near the surface of the soil and are supposed to be rather injurious to other plants growing nearby. The tree thrives best in a climate such as Calcutta where the soil is always moist, and is now one of the commonest and one of most handsome of the trees planted in the streets of the city. It is easily propagated from both seeds and cuttings.

The wood is soft, light, and almost useless either as timber or fuel. The leaves can be used as cattle fodder, and the pods, which contain a rich sugary pulp, are eagerly eaten by horses and cattle. The seeds are said to cause indigestion, but the pods have been recommended as a useful food for men in times of scarcity ; their pulp has a very sweet toffee-like taste when the pods are ripe, but it is difficult to separate it from the husk and seeds.

The usual English name of this tree originated from the fact that in some places it is infested with cicadas which sometimes discharge moisture in the form of innumerable small drops, like rain, on passers-by beneath. This was taken to be a discharge from the tree itself, hence the name "rain tree."



*ENTEROLOBIUM SAMAN*

The flowers appear from March to October, but principally during the early hot weather and at the end of the rains. The leaves fall at the end of the cold season and are replaced in March, to be closely followed by the first flush of bloom.

# ROSACEAE

This is a family of about 90 genera comprising over 2000 species of trees, shrubs and herbs, mostly natives of cool countries. The leaves are very various in form, but are very rarely arranged in opposite pairs. The flowers are usually bisexual and symmetrical. The calyx segments are connected at the base, and normally number 5, the calyx being sometimes joined to the ovary (which is then said to be "inferior"). The petals usually number 5, but are sometimes wanting. The stamens are generally numerous and are inserted either with the petals, or on a disc surrounding the ovary, which is often composed of several or many separate divisions (carpels). The fruits are very various in form, but are often divided into several carpels, which may be joined to form a fleshy composite fruit, e.g. a strawberry, or a raspberry.

This family is of little importance in the tropics though it includes many of the most beautiful garden plants of cool countries and the great majority of the plants that yield edible fruit in temperate climates. In Bengal the family is chiefly represented by the cultivated roses of gardens, and by one species of rose found wild in the northern part of the province. In addition to the tree described below, a few others of this family may occasionally be found planted in the Calcutta area; for instance *Prunus persica* Stokes, the peach, has sometimes been grown in the plains of Bengal, though it does not succeed there.

Near the ninth tee on the Tollygunge golf course there is (in 1944) a large, spreading, evergreen tree with small, pointed leaves, which are yellowish-grey and covered with fine down when young, but dark green and hairless when mature. The small, yellowish-white, scented flowers grow in large drooping clusters at the ends of the branches, and appear from September to December, sometimes in great profusion. This is *Moquilea pyrifolia* R.O. Williams. (*Syn. Licania pyrifolia* Griseb.), a native of the West Indies. It seems to be otherwise unknown in India, and it would be interesting to know how this specimen comes to be growing at Tollygunge.

**ERIOBOTRYA.** (From the Greek "erion", wool, and "botros", a cluster of grapes). A genus of about 10 species of evergreen trees, natives of South-Eastern Asia, of which 6 are indigenous in India and 1 is commonly cultivated. The leaves are leathery and toothed, but not divided into separate leaflets. The flowers have 5 white petals, and grow in woolly branching clusters (panicles) at the ends of the branches. The stamens number 20. The ovary is enclosed by and joined to the calyx (inferior), and has 5 chambers (cells), each containing 2 ovules. The fruit is a berry containing 1 or more large angular seeds.

**Eriobotrya japonica** Lindl. *Syn*. Mespilus japonica *Roxb*. Photinia japonica *Gray*.

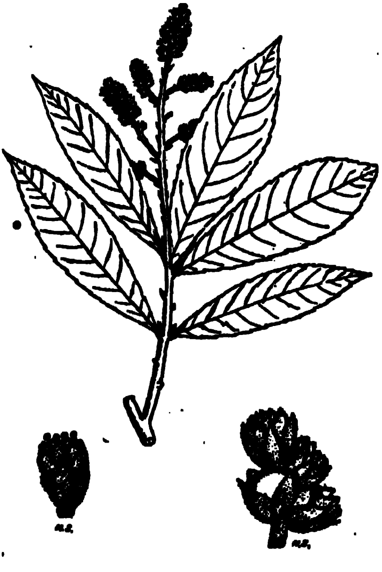
(Japonica means "of Japan".)

| | |
|---|---|
| Hindi, | *logat*. |
| Urdu, | *lakhota*. |
| English, | *loquat, Chinese medlar, Japan medlar, Japan quince*. |

(F.I. p. 406. F.B.I. Vol. II. p. 372. B.P. Vol. I. p. 468.)

A middle-sized evergreen tree; leaves alternate, crowded, subsessile, elliptic or oblanceolate, acute, serrate, smooth above, rusty-tomentose below, 6 to 10 inches long; flowers whitish, nearly hidden in rusty pubescence, scented, about ½ inch diam., in terminal panicles up to 7 inches long; calyx-lobes 5, acute; petals 5, clawed; stamens 20; styles 5; ovary inferior; fruit a pome, ovoid, or pyriform, intruded at the top, up to 1½ inch long, yellow when ripe; seeds 2 to 5.

The loquat is a tree of moderate size with fairly smooth, pale grey bark, and rather large, narrow, thick, and leathery leaves, smooth and dark green on the upper surface but covered with minute rusty-coloured down below, set close together near the ends of the branches. Its leaves have practically no stalks, and their edges are toothed, with thick veins running from the midrib to the points of the teeth. The small, whitish scented flowers grow in dense clusters at the ends of the branches, the blooms being almost concealed in rusty wool. The fruit is a bright yellow, smooth, egg-shaped or pear-shaped, berry containing several large seeds embedded in sweetish acid pulp.



ERIOBOTRYA JAPONICA

This tree is indigenous in China and Japan, but is now much cultivated in warm countries for its delicious fruits. It is often grown in the north of India, and although it does not thrive on the plains of Bengal, it is occasionally found in Calcutta gardens. The fruits vary greatly in shape, size, and flavour, but the best kinds make excellent dessert, and are useful for stewing and for making preserves. The tree is also grown for its ornamental foliage and delightfully scented flowers.

The wood is pink, hard, and close-grained, weighing about 55 lb. per cubic foot. It is of excellent quality, and is a good substitute for pear for making rulers and similar purposes.

Medicinally the leaves are used to cure diarrhoea, and in cases of alcoholic intoxication. The flowers are considered useful as an expectorant.

The flowers appear at the beginning of the cold weather and the fruits ripen in March and April. A second flush of flowers is sometimes produced in August but these do not set fruit in Bengal.

Propagation is effected by seeds or layering ; the plants bear fruit within three years from layering, but seedlings take from eight to ten years to bear.

## COMBRETACEAE

A family of about 16 genera comprising some 250 species of trees, shrubs, and climbers, natives of warm and tropical countries. The leaves are not divided into separate leaflets, and have smooth (entire) edges. The calyx consists of a tube joined to the ovary below, extended beyond it, and divided into 4 or 5 segments at the apex, which often spread widely. The petals are small and borne on the calyx tube between its segments, or sometimes are altogether wanting. The stamens are inserted inside the calyx, and are of the same number as the calyx segments or twice their number. The fruits contain only one seed, and are generally angled or winged.

This is an important family in Indian forests since it includes a number of valuable and common timber trees, which constitute a large part of the vegetation in many districts. The family is named after the genus *Combretum*, which includes about 12 Indian species of shrubby climbers with leaves arranged in opposite pairs, often with showy flowers ; a number of plants of this genus are grown in Indian gardens. The family also includes *Quisqualis indica* Linn., the Rangoon creeper, a large evergreen climber with sprays of very elongated, white and pink, scented flowers, very common in Bengal gardens and found, as if wild, in thickets near Calcutta.

**TERMINALIA.** (A Latin word meaning "terminal" in allusion to the rosettes of leaves at the ends of the branches). This is a genus of over 100 species of large trees, all natives of the tropics, of which about 12 are found in India. The leaves are arranged alternately or in nearly opposite pairs. The small whitish or yellowish flowers grow in long spikes. The calyx tube is bell-shaped with 5 small teeth on the rim, and there are no petals. The stamens number 10 in two rows of 5 each. The fruit is more or less egg-shaped with from 2 to 5 angles or wings.

In addition to the trees described below, *Terminalia tomentosa* W. & A. grows in western Bengal and may occur near Calcutta. This tree resembles *T. Arjuna* in most respects but may be distinguished by its rough, blackish bark, and by the fine, rust-coloured down on its twigs and on the lower sides of its leaves.

**Terminalia Catappa** Linn.

(Catappa is a Malayan name.)

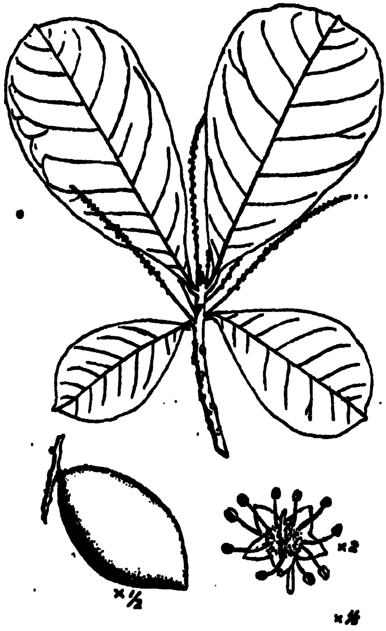
| | |
|---|---|
| Bengali, | *deshi badam, bangla badam.* |
| Hindi, | *badami, hindi badam, jangli badam, patti baddam* |
| English, | *Indian almond, Malabar almond, Malay almond, country almond, tropical almond, almendro, tavola nut.* |

(F.I. p. 380. F.B.I. Vol. II. p. 444. B.P. Vol. I. p. 481.)

A tall, deciduous tree ; branches whorled ; leaves alternate, clustered near ends of branches, obovate from a cuneate or narrow-cordate base, subglabrous, 6 to 10 inches long ; petiole short and stout ; flowers in solitary axillary spikes, shorter than the leaves, the upper flowers male, the lower hermaphrodite ; calyx teeth nearly glabrous within ; petals wanting; fruit ellipsoid, slightly compressed to show 2 ridges, glabrous, about 2 inches long.

This is a tall tree with slightly rough greyish-brown bark, and branches which spread horizontally in whorls from a straight trunk, which is often buttressed at the base. The large, shining, blunt leaves grow near the ends of the branches ; they are widest near the tip and taper to a short leaf-stalk, which is sometimes joined to the leaf in a small recess at the bottom of the narrow base of the leaf. Before they fall in the cold season the leaves turn a fine red colour, this being one of the very few tropical trees to show this peculiarity. The small whitish flowers grow in slender spikes in the axils of the leaves, the spikes being much shorter than the leaves. The flowers near the end of the spike are male only, but those near the base are bisexual. The green fruit is smooth and more or less egg-shaped, but slightly flattened so that it is surrounded by two ridges ; it contains a single nut-like seed embedded in a fibrous and fleshy rind of remarkable toughness.

The kernels of these fruits are eaten, being much like a filbert or almond in flavour. They are said to be wholesome and nutritious, but unfortunately they are usually taken by parrakeets, especially the large parrakeet (*Psittacula eupatria*), before they can be gathered by men. The nuts yield an oil similar to almond oil, but it seems to be little used. The oil cake (the residue after the oil is extracted) is a good food for pigs. The bark and leaves give a black dye, and are occasionally used in tanning ; the black pigment is employed in making ink and for colouring the teeth. A kind of silk-worm, which yields "tasar" silk, is sometimes fed on the leaves.



*TERMINALIA CATAPPA.*

The juice of the young leaves is made into an ointment to cure skin diseases, and is also used for the treatment of headache and colic. The bark is astringent and employed as a remedy for dysentery and bilious fevers.

The wood is hard and rather light, weighing about 32 lb. per cubic foot. It is not much used.

The tree is a native of Malaya, but is now cultivated in most parts of India, especially near the coast. It is commonly planted in the streets of Calcutta and makes a fine avenue tree. It is common in the coastal forests of the Andamans, where its seeds are supposed to have been carried by ocean currents, for which purpose they are well adapted.

The flowers appear principally during March and April, and again during June and July, but a third flush often appears at the end of the rains. The leaves change colour from November onwards, and are renewed in February. The fruits mostly ripen in May and October.

Several varieties are known, differing in the shape of the leaves, and the colour and quality of the fruits. The outer husks of the fruits of one form are sweet and edible.

**Terminalia Belerica** Roxb.

(Belerica is a latinized form of an Arabic name.)

| | |
|---|---|
| Bengali, | *bohera, baheri, buhuru, boyra.* |
| Hindi, | *bahera, bhaira, sagona, bulla.* |
| Urdu, | *behera.* |
| English, | *belleric myrabolan, bastard myrabolan, bedda nut.* |

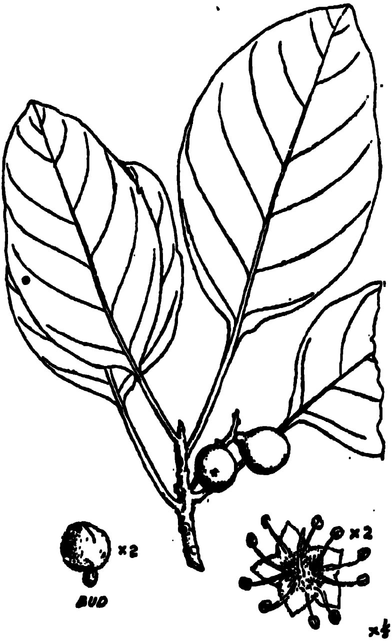
(F.I. p. 380, 381. F.B.I. Vol. II. p. 445. B.P. Vol. I p. 481.)

A large deciduous tree; leaves alternate, clustered near ends of branches, broadly elliptic, narrowed at both ends, glabrous when mature, 4 to 9 inches long; petiole 1½ to 3 inches; flowers greenish-yellow with a strong offensive smell; male and hermaphrodite flowers mixed in simple spikes; calyx woolly with brown hairs within, teeth pubescent; petals wanting; fruit ovoid or obovoid, grey, velvety, about 1 inch long, not winged.

This tall tree has thick, bluish-grey, or brownish bark marked with numerous fine vertical cracks, a straight, often buttressed trunk, and long horizontal branches. The large, pointed, leathery leaves are borne on rather long stalks in clusters near the ends of the branches. Among the leaves the small greenish-yellow flowers grow in narrow, unbranched spikes; they have a strong, and sweet, but offensive smell, which is overpowering when the flowers are near at hand. The rather small, velvety fruit varies in shape from nearly spherical to egg-shaped or pear-shaped, and contains a single seed.

The wood is hard, but not durable and is readily attacked by insects ; it weighs about 48 lb. per cubic foot. It is used for planking, packing cases and many other purposes. Steeping in water renders it more durable.

The fruits are an article of commerce, being used as an inferior dyeing and tanning material, and in making ink. They are eaten by goats, sheep, cattle, deer, and monkeys. The kernels are eaten by men, and taste like filberts, but are said to produce intoxication when taken in excess, especially if water is drunk after eating them. The leaves are considered excellent fodder for milch cows.



*TERMINALIA BELERICA*

The fruit is used for a wide variety of medicinal purposes, including the treatment of diseases of the eye, nose, throat, lungs, and heart. It is also used in cases of dyspepsia. An oil extracted from the seed is considered a good application for the hair.

The tree is excellent for avenue purposes, but a number of superstitions connected with it lessen its usefulness ; thus in the north of India people believe it is inhabited by demons, and will not sit under its shade ; while in other places the people refuse to use its timber for building, in the belief that a house built of it would prove unlucky and uninhabitable.

The tree is found wild in most parts of India, but not in the dryest and wettest areas. It does not occur wild near Calcutta, but is occasionally planted. A good specimen may be seen in the Victoria Memorial garden..

The leaves fall during the cold season and are replaced in March and April, when the young foliage is often copper-coloured. The flowers appear in April and May. The fruits ripen during the cold season and fall in the hot weather.

**Terminalia Chebula** Retz.

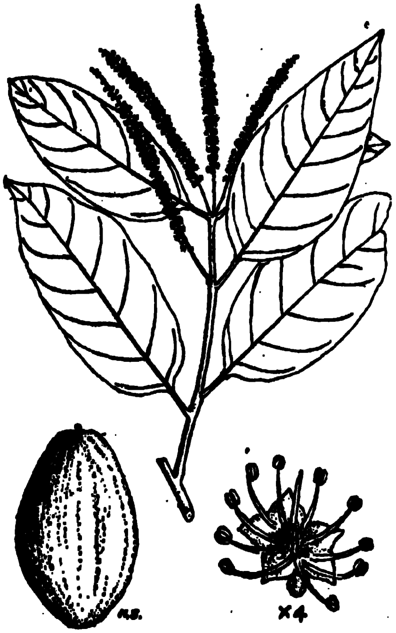
(Chebula is a Malayan vernacular name.)

| | |
|---|---|
| Bengali, | *haritaki.* |
| Hindi, | *har, harara, harra.* |
| Urdu, | *haejarad.* |
| English, | *black myrabolan, chebulic myrabolan, negro's olive tree* (in America). |

(F.I. p. 381. F.B.I. Vol. II. p. 446. B.P. Vol. I. p. 481.)

A tall deciduous tree; leaves distant, often subopposite, elliptic or ovate, usually acute, not acuminate, rounded at the base, glabrous or hairy, 3 to 8 inches long; petiole ½ to 1 inch; flowers all hermaphrodite, whitish or yellowish, about 1/6 inch diam., sessile in terminal spikes, which are usually panicled; calyx campanulate, glabrous outside, hairy within; petals wanting; drupe pendulous, ellipsoidal or obovoid, glabrous, more or less 5-ribbed.

This deciduous tree has thick, dark brown bark marked with numerous vertical cracks, and many spreading branches which have a tendency to droop. The rather broad, pointed leaves grow on short stalks scattered along the branches (not clustered near their ends), often in nearly opposite pairs. The small, yellowish-white, evil-smelling flowers are borne in narrow spikes, which occasionally occur solitarily among the leaves, but usually in open clusters at the end of the branches. The hairless fruits are pear-shaped, usually with five ribs, which become more conspicuous as the fruit dries. Each fruit contains a single seed.



*TERMINALIA CHEBULA*

The wood is very hard and fairly durable, weighing about 55 lb. per cubic foot. It takes a good polish, and is used for making furniture as well as for carts, house-building, and similar purposes.

The fruits are the best and by far the most important of the "myrabolans," which are exported in very large quantities from

India as tanning material. In conjunction with various other substances they are also used in dyeing. The kernels taste like filberts and are sometimes eaten. They are also made into ink and into a black dye for staining the teeth. Galls found on the twigs are also used for tanning, dyeing and ink-making. The leaves afford good fodder for cattle.

The tree is considered to have great medicinal value, though its use is made rather difficult by the fact that the different varieties do not all have quite the same qualities. The unripe fruit is said to cure dysentery, and the ripe fruit is considered a remedy for asthma, sore throat, anaemia, gout, biliousness, heart diseases, and many other disorders. The powdered fruit is used as a dentifrice, and water in which the fruits have been kept overnight makes a cooling wash for the eyes. The fruit is prescribed for snake-bite.

The medicinal qualities of the tree were so much esteemed by the ancient Hindus that a mythological origin was assigned to it. It is said that when Indra was drinking nectar in heaven, a single drop fell to earth and produced the *haritaki* tree.

The tree is common in forests all over the plains of India, except some of the wetter areas. It is not wild near Calcutta but is occasionally planted. A good specimen may be seen on the south side of the garden at Belvedere. The leaves are shed in February and March, when they sometimes assume a reddish colour, and new foliage is produced in April. The flowers appear from April to August and the fruits ripen from November to March. The soil round the fallen fruits becomes blackened by the tannin that escapes from them.

This is a very variable species and several well-marked varieties are found differing in the amount of hair on the leaves, the size of the fruit, and in other respects. The leaves of *T. Chebula* are usually pointed, but they do not taper into a long tail at the apex, and are usually rounded at the base. A tree with leaves tapering into a long point, and narrowed gradually into the leaf-stalk, is regarded as a separate species under the name of *T. citrina* Roxb., though it scarcely differs more from *T. Chebula* than some of the other varieties. *T. citrina* is found in East Bengal, and occurs near Baraset on the east of Calcutta.

**Terminalia Arjuna** W. & A. *Syn*: Pentaptera Arjuna *Roxb.*

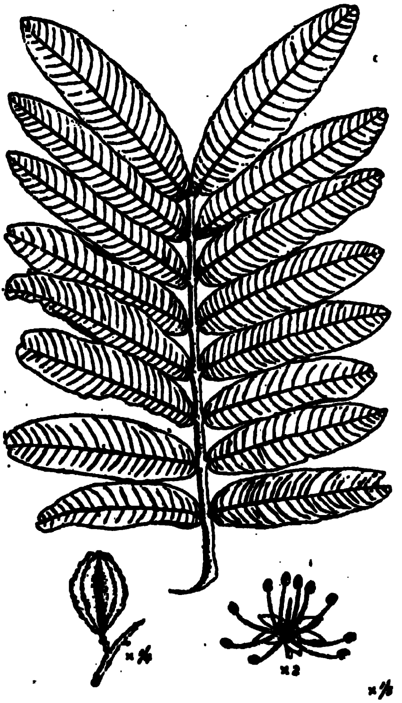
(Arjuna is the common Indian vernacular name.)

| | |
|---|---|
| Bengali, | *arjhan, arjun, kahu.* |
| Hindi, | *arjuna, kawa, koha, kahua, jamla, anjani.* |
| Urdu, | *arjan.* |
| English, | *white murdah.* |

(F.I. p. 382. F.B.I. Vol. II. p. 447. B.P. Vol. I. p. 481.)

A large deciduous tree; almost glabrous; leaves usually sub-opposite, oblong or elliptic, obtuse or very shortly acute, hard, coriaceous, often crenulate, 3 to 6 inches long; petiole ½ inch long; flowers yellowish, in erect terminal panicles; calyx teeth nearly glabrous; petals wanting; stamens 10, conspicuous; fruit ovoid, oblong, or obovoid, with 5 thick narrow wings, about 1 inch long, or longer.

This is a very large tree with thick, smooth, pinkish-grey or whitish bark, which peels off in thin flakes, a huge trunk, often buttressed at the base, and horizontally spreading branches. The narrow, blunt, leathery leaves usually grow in opposite, or nearly opposite pairs; they are set close together on very short stalks, and are quite hairless when mature. In narrow spikes arranged in open clusters at the ends of the twigs the small, yellowish, unpleasantly scented flowers are borne in profusion. The egg-shaped, or pear-shaped, fruits have five narrow wings, which run from base to tip, each fruit containing a single seed.



*TERMINALIA ARJUNA.*

The wood is very hard, and not easy to work, and is apt to split in seasoning. It weighs about 59 lb. per cubic foot. It is used for boats, house buildings, carts, and similar purposes, but is regarded as an inferior timber, because it does not stand variations of temperature and moisture, and is very liable to attacks by white ants.

The bark is of considerable value for tanning and dyeing. The ashes of the wood are also used in conjunction with other substances for dyeing. The leaves are sometimes employed as food for the "tassar" silkworm.

The bark is highly valued for its medicinal qualities, especially as a remedy for heart diseases. It is regarded as tonic, astringent, and cooling and is used in contusions, fractures, ulcers, anaemia, biliousness, and various other disorders. The juice of the fresh leaves is considered a cure for earache.

The tree is a native of central and southern India, where it is common on the banks of rivers and watercourses. It is not wild near Calcutta, but is occasionally planted near villages and in the city. Two fine specimens may be seen in the Zoological Gardens (in 1941). The flowers appear in April and May and the new leaves in March and April. The fruits ripen from February to May.

**ANOGEISSUS.** (From the Greek "ano", above, and "geisson", the eaves of a roof).

A genus of 5 species of trees and shrubs, of which 4 are natives of India, and 1 of Africa. The small flowers grow in dense spherical heads, and have a slender, tubular calyx with 5 segments, no petals, and 10 exserted stamens. The fruits are small and leathery, with 2 broad wings terminating in a sharp beak, and are packed into dense heads.

In addition to the trees described below *Anogeissus latifolia* Wall. grows in West Bengal and may occur near Calcutta. This is a large tree with smooth, whitish-grey bark, and broad, blunt, hairless leaves. It is a well-known forest tree in the dryer parts of India and is valued for its tough and elastic timber.

**Anogeissus pendula** Edgew.

(Pendula is Latin meaning "drooping".)

(F.B.I. Vol. II. p. 451. Not in F.I. & B.P.)

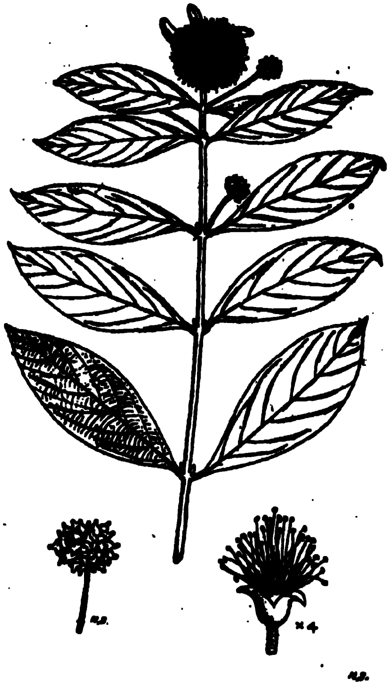
A small tree; branches drooping; branchlets and leaves silky; leaves broadly elliptic, lanceolate, or oblanceolate, acute or obtuse, ¾ to 1 inch long; petiole very short; flowers minute, whitish, in globose heads less than ¼ inch diam.; fruit 2-winged, glabrous below, hairy above, beaked.

This is a low tree or shrub with drooping branches, and very small leaves set on short stalks scattered along the slender twigs. Before they fall in January the leaves often turn red. The minute whitish flowers appear during the rains in spherical heads borne on slender stalks, which spring from the axils of the leaves. The small dry fruits each have two wings and a short beak at the apex;

many of them are packed into one dense head, and each contains a single seed.

The wood is hard and weighs about 59 lb. per cubit foot; it is said to be the world's toughest wood, and to be ideal for making the handles of heavy striking tools, such as axes.

The tree is common in some parts of north-west India where it grows gregariously and is the principal tree of the forests. It is occasionally planted in Calcutta gardens, and a specimen may be seen (in 1943) near the north-east corner of the Victoria Memorial garden. The flowers appear mostly in July and August, and the new leaves open at the end of February or in March. The fruits ripen in January, when the old leaves are changing colour.



*ANOGEISSUS PENDULA*

**Anogeissus acuminata** Wall. *Syn.* Conocarpus acuminata *Roxb.*
(Acuminata is Latin meaning "long pointed", in allusion to the shape of the leaves).

Bengali, *chakwa.*

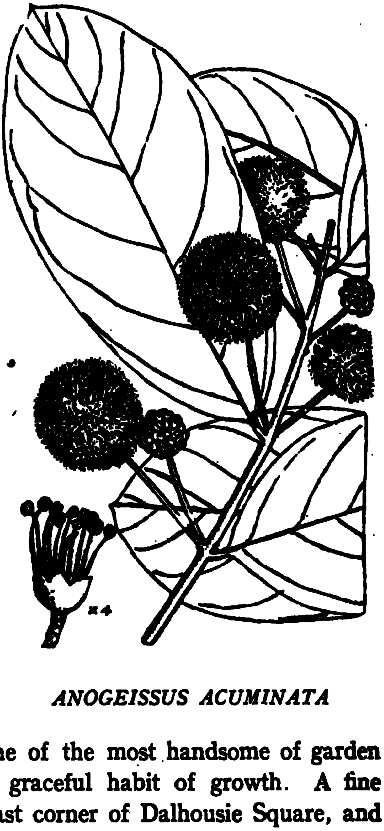
(F.I. p. 384. F.B.I. Vol. II. p. 450. B.P. Vol. I. p. 479.)

A large tree with drooping branches; branchlets and undersides of mature leaves pubescent; leaves elliptic or lanceolate, acuminate, sub-opposite, 1 to 3 inches long; petiole ¼ inch; flowers minute, whitish, in globose heads ½ to 2/3 inch diam.; peduncles usually solitary; ripe fruits shining, glabrous, up to ¼ inch broad, in dense heads.

This is a tall evergreen tree with thick, rough, dark grey bark, usually a crooked trunk, and very numerous spreading and drooping branches, reminiscent of a "weeping willow". The small, narrow, long-pointed leaves are borne on short stalks scattered along the branches, sometimes in nearly opposite pairs.

A fine down covers the twigs, flower-stalks, and the undersides of the leaves, but the upper sides of the leaves are smooth and hairless when mature. The diminutive, yellowish-white, slightly fragrant flowers grow in small, dense, spherical heads, each of which is borne on a stalk not longer than the width of the head. The fruits are also crowded into dense round heads, and are smooth and shining, with two narrow wings and a short beak at the apex. Each fruit contains a single seed.

The wood is hard, very strong, and elastic, its weight being about 55 lb. per cubic foot. It is useful where strength and shock-resisting qualities are required.



*ANOGEISSUS ACUMINATA*

This beautiful tree is a native of Burma, the Mahanadi valley, and the Northern Circars. It is occasionally planted in Calcutta as an ornamental tree, and although its flowers are quite insignificant, it may be considered one of the most handsome of garden trees owing to its stately and graceful habit of growth. A fine specimen grows in the south-east corner of Dalhousie Square, and others near the main gate of the Zoological Gardens. The flowers appear in February and March.

## MYRTACEAE

This is a family of about 75 genera with about 2000 species of trees and shrubs, natives of warm and tropical countries. The leaves contain oil glands, and are usually arranged in opposite pairs, their edges generally being quite smooth (entire). The flowers are symmetrical, and usually bisexual, with 4 or 5 petals and numerous stamens. The ovary is enclosed in the calyx, and entirely joined to it. The fruit is usually fleshy and contains one or more seeds.

This family takes its name from the genus *Myrtus*, which includes *Myrtus communis* Linn., the myrtle, an evergreen shrub with aromatic leaves and small white flowers, often grown in Indian gardens as well as in Europe.

**SYZYGIUM.** (From the Greek "suzugos", paired). A genus of about 650 species of trees and shrubs, natives of the tropics. The leaves are nearly always evergreen and arranged in opposite pairs, the smaller veins branching from the central vein of the leaf. The calyx has 4 segments, encloses the ovary, and usually projects beyond it, forming a more or less bell-shaped cup. The petals nearly always number 4, and are either separate, or joined at the top into a cap (calyptrate). The numerous stamens are inserted in several whorls on a disk at the mouth of the calyx-tube. The fruit is a berry containing 1 or several seeds.

This genus was formerly known as *Eugenia* (said to be named after the famous Prince Eugene of Savoy). Some authorities retain the name *Eugenia* for the species without a thick disc below the stamens, and include those with a thick disc and large flowers in the genus *Jambosa*. In all about 50 species are found in India.

In addition to the trees described below, *S. uniflora* Linn. (*Syn. S. Michelii* Lam.), the Brazil cherry, or Surinam cherry, a native of South America, is occasionally grown in Indian gardens. This is a large bushy shrub, or small tree, with myrtle-like leaves about 1½ inch long, and pale greenish-white flowers about ½ inch wide. The round fruit is about 1 inch across, is like a miniature tomato, and is considered edible. A specimen of this plant grew (in 1944) in the grounds of Hastings House, Alipore.

**Syzygium Jambos** (L.) Alston. *Syn.* Eugenia Jambos *Linn.* Jambosa vulgaris DC.

(Jambos is a Malayan vernacular name).

| | |
|---|---|
| Bengali, | *golab jamb.* |
| Hindi, | *gulab jaman.* |
| English, | *rose apple, Malay apple, jambosade.* |

(F.I. p. 401. F.B.I. Vol. II. p. 474. B.P. Vol. I. p. 490.)

A small evergreen tree; leaves opposite, narrowly lanceolate or elliptic, thinly coriaceous, acuminate, glabrous, 4 to 7 inches long; petiole ¼ inch; flowers greenish-white, 2 to 4 inches wide, in short terminal racemose cymes; calyx-tube obconical, ½ inch long, lobes subequal, rounded; petals 4, free; stamens about 1½ inches long; fruit globose, or pear-shaped, smooth, 1½ to 2 inches long, yellowish or pink; seeds 1 or 2, grey.

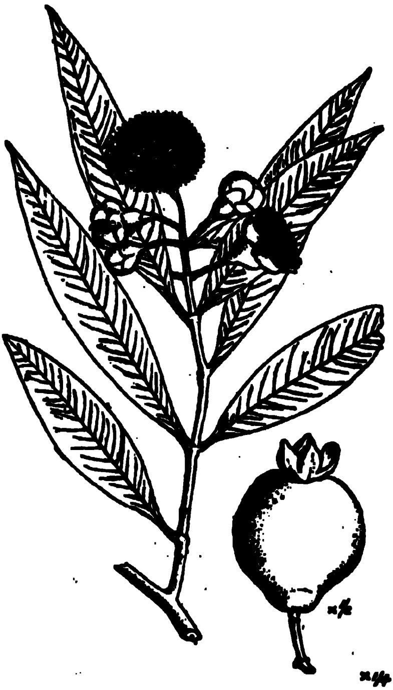
This is an evergreen tree of small or medium size with slightly rough, greyish bark, and narrow, pointed, shining leaves set on short stalks in opposite, or nearly opposite, pairs. The large greenish-white flowers are borne in small clusters, at the ends of the branches, the innumerable long stamens forming the conspicuous part of the blooms. The fragrant smooth and shining fruits are of the size, and often rather of the shape, of a small apple, and are usually of a fine pink or apricot colour, but sometimes whitish.

This handsome tree is usually grown in gardens more for ornament than for its fruits, for although they have a sweetish taste like rose-water, they can only be considered very poor eating owing to their woolly consistency and lack of juice ; though they may be better when grown in climates more suitable for them than that of Bengal. They are said to be sometimes used in preserves.

Medicinally the fruit is valued as a tonic for the brain and in liver complaints. The bark is regarded as a remedy for asthma and bronchitis, and is said to improve the voice. The leaves are boiled and applied to sore eyes.

The wood is brown and rather soft.

The tree is a native of Malaya and Burma, but is now commonly cultivated in most parts of India and has run wild in some places. It is common in Calcutta gardens and in the surrounding villages, especially to the south of Calcutta.



*SYZYGIUM JAMBOS*

The flowers appear chiefly in March and April, and the fruits usually ripen during the rains, but some varieties produce fruits in February and March. Propagation is effected by layering and fruits are produced within four years.

**Syzygium samarangense** (Bl). Merr. & Perr. *Syn.* **Eugenia javanica** *Lamk.* **Eugenia alba** *Roxb.*

(Samarangenese means "of Samarang", a town in Java. Javanica means "of Java". Alba is Latin meaning "white".)

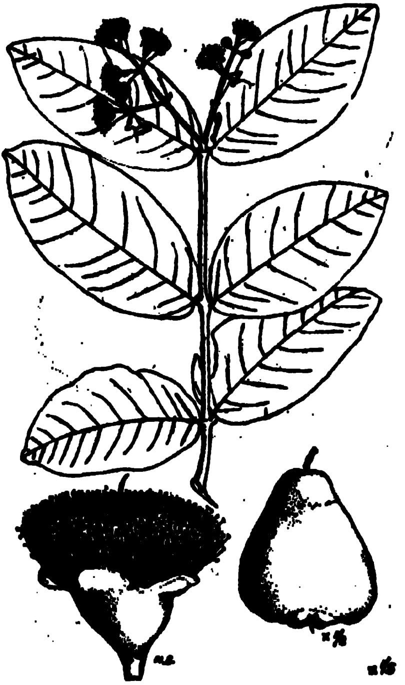
| | |
|---|---|
| Bengali, | *jamrul.* |
| Hindi, | *jamrul, amrul.* |
| English, | *wax jambu, jumrool.* |

(F.I. p. 400. F.B.I. Vol. II. p. 474. Not in B.P.)

A middle-sized tree ; leaves subsessile, opposite, elliptic-oblong, obtuse or obtusely-acuminate, rounded or subcordate at the base, glabrous, about 6 inches long ; flowers whitish, about 1½ inches diam., in

**many-flowered, terminal and axillary cymes, which are shorter than the leaves; calyx-tube turbinate, slender below, lobes 4, rather unequal, membranous at the edges; petals 4, free; fruit shining, depressed-turbinate, almost flat, about 2 inches wide, crowned by the fleshy, incurved calyx-lobes, white or pinkish-white.**

The jamrul is a medium-sized tree with slightly rough, greyish bark, a short trunk, many branches, and large, narrow, smooth, shining leaves set in opposite pairs practically without stalks. Among the leaves the whitish flowers grow in small clusters scattered along the twigs, their numerous slender stamens being the most noticeable part of the blooms. The shining, white, wax-like fruits are often borne in great profusion; they are shaped rather like a pear but are decidedly flattened laterally and have a depression at the outer end surrounded by the remains of the lobes of the calyx.



*SYZYGIUM SAMARANGENSE*

This is a handsome tree, and is usually grown more as an ornament than for its fruits, which although juicy, are almost tasteless, and are not much eaten except by poor people. The flowers appear in March and April, and the fruits ripen from April to June. The flowers are much less handsome than those of *S. Jambos.*

The tree is a native of the Andamans, the Nicobars, and Malacca. It is now cultivated in many countries, and is very common near villages and in gardens in the neighbourhood of Calcutta.

Propagation is effected by layering, and the trees bear fruits within four years.

**Syzygium malaccense** (L.) Merr & Perry. *Syn.* Eugenia malaccensis *Linn.*

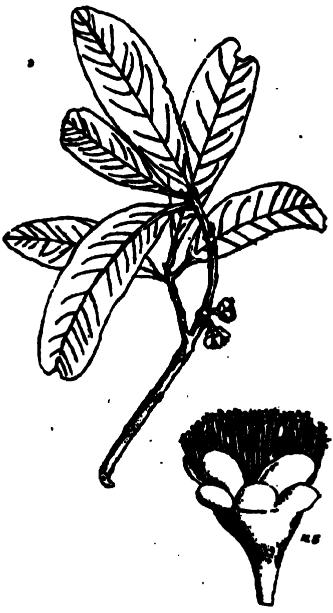
(Malaccense means "of Malacca").

| | |
|---|---|
| Bengali, | *malaka jamrul.* |
| Hindi, | *malayajam.* |
| English, | *Malay apple, Otaheite cashew, kavika tree, Malay rose-apple.* |

(F.I. p. 397. F.B.I. Vol. II. p. 471. B.P. Vol. I. p. 490).

A tree or shrub; branchlets compressed; leaves opposite, elliptic-lanceolate or oblanceolate, thinly coriaceous, glossy, 9 to 12 inches long; petiole ⅓ to ½ inch long; flowers sessile, crimson, 1 to 1½ inches wide, usually in 3-flowered cymes from the old wood; calyx tube infundibuliform, 2/3 inch long; segments ¼ inch long; petals free, ½ inch long; fruit turbinate or ovoid, glossy, white pink or purple, crowned by the calyx lobes, 2 inches long.

This is an evergreen tree or shrub with large, deep green, glossy, narrow leaves set on short stalks in opposite pairs. The crimson flowers grow in small clusters from the thicker twigs, their numerous long stamens being very conspicuous and handsome. The fruit resembles, that of the common jumrool (*S. Samarangense*), but is usually of a fine pink or crimson colour, and is not flattened near its base. In shape it is usually pear-shaped with a depression at the end surrounded by the old lobes of the calyx, and in texture is glossy and wax-like. Its pulp is white and fairly juicy, but without much flavour. The bark is pinkish-grey and fairly smooth, and peels off in small flakes.



*SYZYGIUM MALACCENSE*

This tree is a native of Malaya, where it is much admired on account of its leaves, flowers, and fruits, its name being a bye-word for all that is lovely and beautiful. The fruit is regarded as very wholesome, and is much eaten, though in India it seems to be scarcely edible. The tree is occasionally grown for ornament in Calcutta gardens.

The wood is rough and soft, weighing about 38 lb. per cubic foot.

The flowers mostly appear in the hot season and the fruits ripen from May to July, often giving another crop in November and December. Propagation is chiefly effected by seed.

**Syzygium Cumini** (L.) Skeels. *Syn.* S. Jambolana (*Lamk.*) DC. Eugenia Jambolana *Lamk.*

(Jambolana is a latinized form of the Portugese name).

| | |
|---|---|
| Hindi, | *jam, kala jam.* |
| Bengali, | *jaman, jam, jamun, phalinda, jamni phalani, phaunda, paiman, bahojaman.* |
| English, | *black plum, Java plum, jambol, Indian blackberry.* |

(F.I. p. 398. F.B.I. Vol. II. p. 499. B.P. Vol. I. p. 491.)

A large glabrous tree; leaves opposite, coriaceous, elliptic, elliptic-lanceolate, ovate, or oblong, obtuse or acuminate, glabrous, shining, 3 to 6 inches long; petiole ½ to 1 inch; flowers whitish, sessile, scented, in compound trichotomous cymes; calyx-tube turbinate, ⅛ to ¼ inch long; petals calyptrate; stamens many, as long as the calyx-tube; drupe juicy, pink when ripening, black when ripe, ½ to 1½ inches long, ovoid, oblong, or globose; seed usually 1.

This is a large evergreen tree, usually with a rather crooked trunk and many branches, of which the smaller have a tendency to droop, the whole forming a large, beautiful, shady head. The bark is smooth and light grey with broad patches of darker colour. The rather small, narrow, pointed leaves grow in opposite pairs, on stalks of considerable length scattered along slender pendulous twigs. The leaves are leathery in texture, smooth, and shining; they are marked with translucent dots, which are visible if the leaf is held up against the light; and the numerous veins, which branch from the midrib, before reaching the edge of the leaf meet and join another vein which runs round the leaf a short way inside the margin. In the hot season the small, fragrant, whitish flowers grow in open clusters, which are borne on rather long stalks from the branches below the leaves. The petals remain joined together and fall off in one piece like a cap, exposing the numerous prominent stamens. The smooth, shining fruits vary in size and shape from a pea to a pigeon's egg; they are usually pink when ripening and almost black when fully ripe. Each normally contains a single seed set in juicy pink pulp, like a plum or cherry.

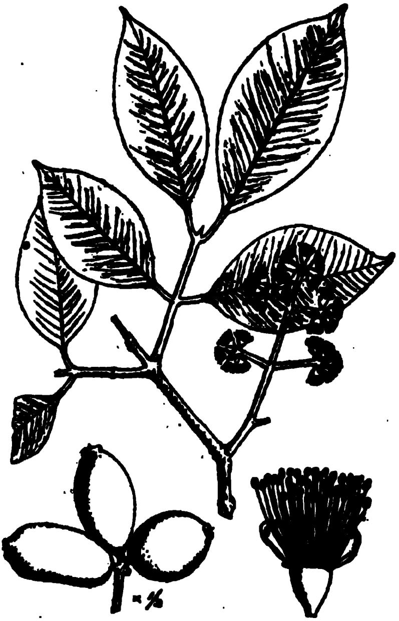
This tree varies very greatly in many respects, and especially in the shape and size of the leaves and fruit. Good varieties yield fruits not unlike a damson in appearance with a peculiar and pleasant flavour, while those of inferior varieties are small, acid, and almost uneatable. The fruit is said to be improved by being pricked and allowed to stand in salt for a short period. An alcoholic drink, said faintly to resemble port, is sometimes made from it.

The wood is rough, fairly hard, and durable, especially under-water. It weighs about 48 lb. per cubic foot. It gives a good fuel, and is largely used in villages for building purposes, carts, implements, and wells.

The bark is said to be useful for dyeing and tanning, and to preserve fishing nets.

Medicinally the bark is a strong astringent and is considered a remedy for sore throats, bronchitis, asthma, dysentery, and several other diseases. The fruit is regarded as a tonic, and is employed to strengthen the teeth and gums. The seeds are said to be good for diabetes.

Hindus use the leaves and fruits in the worship of the God Ganesa or Vinayaka, the elephant-headed God who is the emblem of "Pranava" or "Om", the highest pinnacle of Hindu religion and philosophy. The tree is also said to be sacred to Krishna, possibly because of the blackness of its fruit. Buddhists venerate the tree also.



*SYZYGIUM CUMINI*

The tree is a native of most parts of India, except the dryest regions, and extends through Malaya to Australia. It is common near Calcutta in the neighbourhood of villages. Some fine specimens may be seen (in 1942) near the north-east corner of the Zoological Gardens.

The flowers appear from March to June, and the fruit during the early part of the rains. The new leaves are mostly produced at the end of the cold season. Propagation is usually done by seed but grafting is also practised. The trees bear fruit in from four to six years.

**PSIDIUM.** (Possibly from the Greek "sidion", pomegranate-peal).

A genus of about 100 species of trees and shrubs, natives of America, of which one species is cultivated in most tropical countries and is naturalised in India. The leaves are arranged in opposite pairs, and their veins branch from the midrib. The calyx is closed when in bud and opens into 4 or 5 irregular segments when in flower. The petals are separate and number 4 or 5. The berry contains numerous seeds.

In addition to the common tree described below, several other species with edible fruits are occasionally grown in India; these seldom exceed the size of a shrub.

**Psidium Guayava** Linn. *Syn.* P. pyriferum *Linn.* and P. pomiferum *Linn.* (Guayava is the Spanish name, probably of West Indian origin).

| | |
|---|---|
| Bengali, | *piyar, piyara.* |
| Hindi, | *amrut, amrud, safri am, safed safari, gabu.* |
| English, | *guava.* |

(F.I. p. 396. F.B.I. Vol. II. p. 468. B.P. Vol. I. p. 487.)

A large shrub or small tree, pubescent on the young branches; leaves opposite, elliptic-oblong, usually acuminate, subglabrous above, pubescent beneath with prominent nerves, 4 to 6 inches long; petiole about ½ inch; peduncles axillary, 1 to 1½ inches long, 1- to 3-flowered; flowers white, about 1½ inches diam.; petals broad, about ½ inch diam.; fruit a globose or pyriform berry, 2 inches long or more; seeds usually many, very hard.

The guava is a large shrub, or a small tree, with smooth, pale greyish bark, which peels off in thin patches. It has dark green, rather narrow, pointed leaves set in opposite pairs on short stalks along the smaller stems; they are smooth and almost hairless above, but beneath are covered with fine down and marked with prominent veins. The young twigs are square, and have narrow wings at their corners. The white flowers grow singly, or two or three together, on short stalks that spring from near the bases of the leaves, each flower having four or five broad white petals and numerous stamens. The fruit consists of a large spherical or pear-shaped berry, usually yellowish outside, containing a quantity of white or pinkish pulp, in which many small seeds are embedded.

There are many varieties of this tree which differ greatly in the appearance and quality of their fruit. The two principal kinds, which were formerly considered to be distinct species, are ***var. pyriferum*** with pear-shaped fruit and solitary flowers, and ***var. pomiferum*** with spherical fruit and flowers usually in clusters of two or three. Both these varieties are commonly grown and many subvarieties can be distinguished, of which the flesh of some is white and of others red. The flavour varies greatly, and while the seeds of some kinds are large and hard, others have soft, small seeds which can be chewed, and a seedless variety is sometimes grown. Two of the best kinds grown in Bengal are known as "Benares" and "Allahabad". The fruit is one of the most important of those cultivated in Bengal, and is eaten by all classes of people, both raw and cooked. It is often used for making the well-known "guava jelly" and "guava cheese", which are exported in considerable quantities to Europe and elsewhere.

The wood is fairly hard and even-grained, weighing about 42 lb. per cubic foot. It is easily worked and is valued for wood-engraving and for making instruments. The leaves and bark are employed for dyeing and occasionally for tanning.

Medicinally the bark is astringent and is a common remedy for dysentery. The leaves are used in the same way as the bark, and also for wounds and ulcers. The fruit is considered a remedy for colic, and the leaves are chewed as a cure for toothache.

The flowers appear principally in the hot season but also during the rains. The fruits ripen from the early part of the rains to the end of the cold season, the best fruit often being produced late in the year. The trees are propagated by seed or by "gootee". They bear fruit when two to four years old, and usually die after yielding fruit for six or seven years.

PSIDIUM GUAYAVA

The guava is a native of Brazil, but is now common in most tropical countries. Near Calcutta it is abundant in gardens and near villages, and is sometimes found growing in thickets as if wild.

A variety with variegated foliage is sometimes grown in gardens.

**EUCALYPTUS.** (From the Greek "eu", well, and "kaluptos", covered, in allusion to the top of the flower being closed by the petals, which are joined to form a cap). This is a genus of about 140 species of trees, all natives of Australia except a few which are found in the islands of the Indian archipelago. The trees are evergreen and hairless, and sometimes attain an enormous size. The leaves of young trees are usually without stalks and arranged in opposite pairs, but those of mature trees usually have short stalks and are alternately arranged. The calyx-tube is not divided into segments, but the petals are joined into a cap, which closes the orifice of the calyx. The stamens are numerous, and the fruit, which is covered by the enlarged calyx-tube, is usually hard and woody; it splits open at the top to release the numerous seeds.

A large number of species are cultivated in India, especially in the Nilgiris, on account of their rapid growth and useful timber. Of these perhaps the most important is *E. globulus* Labill. the blue gum, which has very narrow glaucous leaves 6 to 9 inches long, and large flowers having a calyx covered with a bluish-white bloom. In addition to the species described below, several others are occasionally planted in Bengal, including *E. globulus* Labill., and *E. robusta* Sm., the swamp mahogony, which has narrow leaves 5 to 7 inches long on stalks one inch long, and small flowers borne in clusters of 4 to 12 flowers on stout, angular stalks from near the bases of the leaves.

**Eucalyptus citriodora** Hk.

(Citriodora is Latin meaning "with a smell of lemon").

English, *lemon-scented eucalypt, citron-scented gum.*

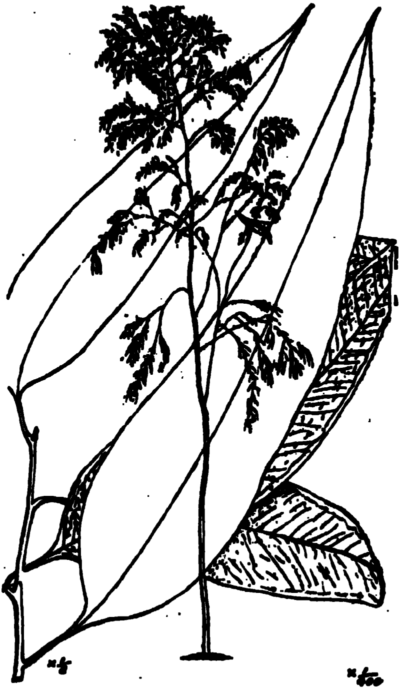
(Not in F.I., F.B.I., & B.P.)

A tall slender evergreen tree; leaves alternate or sub-opposite, coriaceous, glabrous when mature, penninerved, linear-lanceolate, acuminate, acute, rather oblique, up to 8 inches long, scented; petiole ½ inch; flowers in 3-flowered umbels arranged in panicles on short leafless branches; pedicels short; operculum hemispheric; stamens numerous, opening by slits; fruit ovoid-urceolate, about ½ inch diam.

This is a tall, graceful tree with a very slender trunk, and smooth, pale, greyish bark which peels off in large patches during the hot season exposing whitish areas beneath. The trunk is usually undivided and tapers gradually upwards supporting only a few slender branches, the lowest of which often spring from a point not far above the ground. The long, narrow, pointed leathery leaves grow sparsely on short stalks from delicate twigs, which often have a drooping tendency. When rubbed the leaves have a strong and delicious scent, very like that of "lemon verbena" (*Lippia citriodora* H. B. & K.). The young leaves and the leaf-stalks are often pink or red. The small, whitish flowers grow in clusters, on short, leafless branches, and the fruit is a nearly spherical berry containing a number of seeds; but flowers and fruits seem seldom to be produced in the climate of lower Bengal.

The remarkably slender trunk and branches of this tree, together with its narrow, widely scattered leaves, give it an entirely distinctive look, which easily distinguish it from all other trees in Bengal except perhaps some other species of *Eucalyptus* which may possibly be found in Calcutta gardens. This species however seems to be the only one of its genus which is at home in the wet climate of Bengal. In recent years it has been much planted in and near Calcutta, and its graceful look makes it a valuable addition to any park or garden, especially when a number of these trees are grown together to form a clump. Its growth is extremely rapid, and it will attain a height of about 30 feet in four years.

The timber is hard, light-coloured, and close-grained; it is valued for shipbuilding, coachbuilding and making the handles of tools. Owing to its rapid growth the tree is of considerable economic importance in its native country, North Queensland.



*EUCALYPTUS CITRIODORA*

**MELALEUCA.** (From the Greek "melas", black, and "leukos", white, in allusion to the appearance of the bark). This is a genus containing about 100 species of trees and shrubs, all Australian, of which one extends into tropical Asia. The leaves are long and narrow with 3 to 7 longitudinal nerves all springing from the base of the leaf, and are nearly always not set in opposite pairs. The calyx-tube is nearly spherical with 5 segments, and the 5 petals spread widely. The numerous stamens are united into 5 bundles opposite the petals. The fruits open by 3 valves, and contain many seeds.

**Melaleuca Leucadendron** Linn.

(Leucadendron is Greek meaning "white tree").

| | |
|---|---|
| Bengali, | *cajuputte, ilashie, cajaputi.* |
| Hindi, | *kayaputi,* |
| English, | *white bottle-brush, cajeput oil tree, swamp tea tree, punk tree.* |

(F.I. p. 591, 592. F.B.I. Vol. II. p. 465. B.P. Vol. I. p. 486.)

A middle-sized tree; leaves alternate, elliptic or narrow-lanceolate, oblique, coriaceous, tapering to a short petiole, 2 to 5 inches long, with

3 to 7 longitudinal nerves; flowers whitish, sessile, in axillary spikes 2 to 6 inches long, the rachis often prolonged and leaf-bearing; stamens numerous, exserted, united at their base into 5 bundles opposite the petals, about ½ inch long; petals 5, ⅛ inch long; fruiting calyx about 1/6 inch diam., cylindric.

This is an evergreen tree of medium size with a straight trunk, short branches, and thick, spongy, whitish bark, which peels off in papery flakes. The branches are slender and pendulous, and the dark green leaves are narrow and pointed with a leathery texture. Among the leaves the small whitish flowers grow in narrow cylindrical spikes, which are conspicuous only because of their numerous projecting stamens. The central stalk of the spike on which the flowers rest is usually prolonged beyond the flowers and there bears leaves. The small greenish fruits are cylindrical in shape with a deep depression on top, each containing many minute seeds.

*MELALEUCA LEUCADENDRON*

The narrow spikes of flowers, with numerous projecting stamens are peculiar to this plant and to its near relatives, and have been likened to the brushes used for cleaning bottles, hence the common English names of these trees.

The leaves are strongly scented when rubbed, and yield the cajuput oil of commerce, which is widely used in medicine, chiefly as an application in the treatment of rheumatism. It is also regarded as a valuable stimulant especially in cases of cholera, and is employed to cure skin diseases, and also to keep away mosquitoes, for which purposes it is said to be superior to citronella oil because it volatizes more slowly. The bark too is used as a stimulant and tonic.

The wood is hard and weighs about 49 lb. per cubic foot.

The papery bark is said to be used in some parts of India for inscribing sacred writings. It is also employed for making torches, boat-building, and packing fruits, for it is very durable and almost impervious to water.

The tree is a native of Burma, the Malay Islands, and Australia, and is widely cultivated in the tropics. It withstands salt water, and is often grown near the sea. It is not uncommon in Calcutta gardens.

The flowers appear in profusion at intervals throughout the hot season and rains. Large quantities of small seeds are produced which seldom germinate when artificially sown, but large numbers of seedlings spring up round the trees. It appears that the seeds need the presence of moss or algae in order to germinate successfully.

**CALLISTEMON.** (From the Geek "kallos", beauty, and "stemon", a stamen). A genus of about 25 species of trees and shrubs, natives of Australia. The leaves are long and narrow, usually fragrant when crushed, and not set in opposite pairs. The flowers grow in cylindrical spikes near the ends of the branchlets. The calyx-teeth and the petals number 5 each, but the petals soon fall off. The stamens are numerous and separate, forming the conspicuous part of the flowers. The fruit consists of a capsule which persists for several years before shedding its seed. The genus is distinguished from *Melaleuca* chiefly by its separate stamens, (those of Melaleuca are joined into 5 bundles).

A number of species of this genus are cultivated in various parts of the world, and in addition to the tree described below *C. salignus* DC., a small tree with whitish or yellow stamens, is occasionally grown in India. Other species with red flowers may also be met with.

**Callistemon lanceolatus** DC.

(Lanceolatus is Latin meaning "lancet-shaped", in allusion to the leaves.)

| | |
|---|---|
| English, | *red bottle-brush, mountain rata, bottle brush.* |

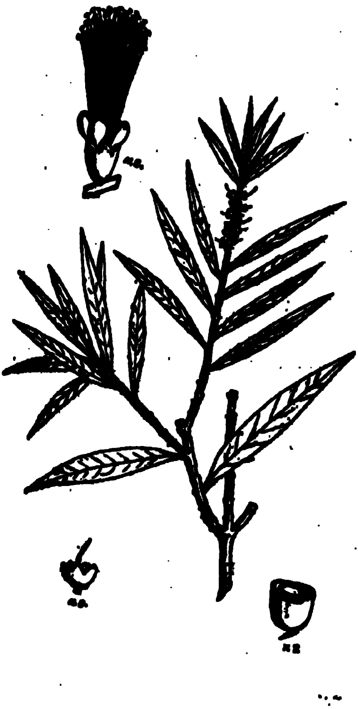
(Not in F.I., F.B.I. and B.P.)

A small evergreen tree ; leaves linear-lanceolate, 1¼ to 2½ inches long by about ¼ inch wide, glabrous, coriaceous, acute, reddish when young, midrib prominent ; petiole short ; flowers in cylindrical terminal spikes 2 to 4 inches long, the axis produced as a leafy shoot ; calyx pale greenish, 5-toothed ; petals 5, caducous ; stamens numerous, free, about 1 inch long, red ; fruit ovoid, truncated and contracted at apex, opening by small loculicidal slits at the apex.

This is a low, evergreen tree with slender drooping twigs and greyish-brown, very rough bark deeply cleft vertically into narrow ridges. The very narrow, smooth and leathery, pointed leaves are clustered near the ends of the twigs. Among the leaves the small flowers, which are conspicuous owing to their numerous bright red stamens projecting stiffly outwards, are densely crowded on the twigs, so that the stamens look like the bristles of a cylindrical brush, hence the common English name of "bottle-brush", which is applied to all members of the genus. The twig on which the spike of flowers is borne usually grows on beyond the flowers, and there bears leaves. The fruit is a small cup-shaped capsule, slightly contracted and truncated at the apex and containing numerous minute seeds. The young leaves often have a reddish tint.

This very graceful little tree is a native of Australia, but is now cultivated in many countries and is often planted in India. The bright red, drooping, spikes of flowers are handsome, and have the merit of appearing periodically at almost all times of the year including the cold season. The tree is common in Calcutta gardens.

The wood is hard and very close-grained, weighing about 54 lb. per cubic foot.



*CALLISTEMON LANCEOLATUS*

# LECYTHIDACEAE

A family of 18 genera with about 220 species of tropical trees. The leaves are not arranged in opposite pairs, but are usually clustered near the ends of the branches. The calyx-segments and petals number 4, 5 or 6 each, and the stamens are numerous and more or less united at the base in several whorls. The fruit is a berry, or a capsule, with several seeds. The family has often been included in *Myrtaceae*, from which it is chiefly distinguished by the absence in its leaves and flowers of the oil glands, which in the case of the *Myrtaceae* can be seen as translucent spots if a leaf is held up against a bright light.

The family takes its name from *Lecythis*, a South American genus scarcely represented in India, though *Lecythis Zabucajo* Aubl., the monkey-pot tree, is occasionally cultivated in tropical countries for its large gourd-like fruits which are used for catching monkeys and other animals; having inserted its hand or head into the fruit to extract the contents, the monkey is unable to withdraw it and can then be captured.

**BARRINGTONIA.** (Named after D. Barrington, an English naturalist, d. A.D. 1800). A genus of about 30 species of tropical trees usually with evergreen leaves not arranged in opposite pairs, and flowers in spikes or elongated clusters (racemes), frequently pendulous. The calyx-tube encloses the ovary, and is not produced beyond it. The petals number 4, or occasionally 5, and are usually attached to the tube formed by the base of the numerous stamens, which are joined at their base. All the stamens are fertile and bear anthers. The fruit is a fleshy and fibrous berry containing one seed.

Two species are natives of India, both of which are found in Bengal.

**Barringtonia racemosa** Roxb.

(Racemosa means "in the form of a cluster of grapes").

| | |
|---|---|
| Bengali, | *samudra, [illegible]da.* |
| Hindi, | *ijjul.* |
| English, | *Indian oak, bottle-brush oak.* |

(F.I. p. 446. F.B.I. Vol. II. p. 507. B.P. Vol. I. p. 493.)

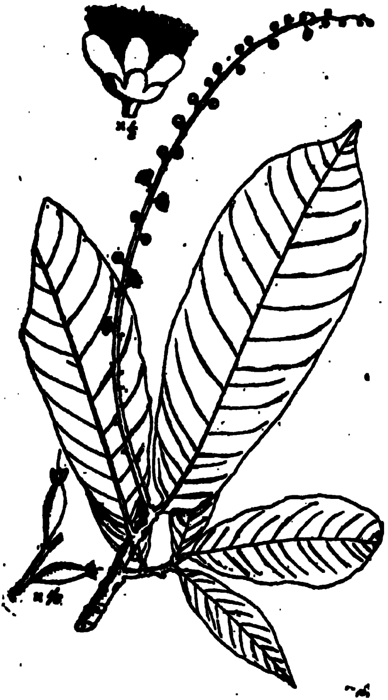
A medium-sized evergreen tree ; leaves crowded near ends of branches, obovate or oblanceolate, slightly crenate-denticulate, 6 to 12 inches long; petiole about 1/5 inch long ; racemes pendulous, 12 to 18 inches long ; flowers about 2½ inches diam., distant, cream-coloured with pink stamens ; calyx splitting irregularly into 2 or 3 segments ; fruit ovoid, 2 to 2½ inches long.

This is a stout evergreen tree with a fairly straight trunk, numerous spreading branches, and greyish brown bark rough with many longitudinal fissures. The leaves are clustered near the ends of the branches on very short stalks, each leaf being pointed, broadest near the apex, and tapering to its base, with finely toothed edges. The large flowers are borne on long pendulous spikes, which hang from the branches with the flowers facing downwards. In reality the greater part of each flower is usually of a pale cream-colour, but the many prominent stamens are bright pink, and give the impression that the whole flower is rose-coloured. The flowers open in succession from the base of the spike, and soon fall to the ground where they almost invariably alight with their stamens upwards, carpeting the ground beneath the tree with pink blossoms. The fruits are large, egg-shaped, nearly smooth berries, each containing a single seed surrounded by a fibrous rind ; they are adapted for dispersal by floating in water.

The wood is white and soft weighing only about 27 lb. per cubic foot. It is only used for firewood.

The root is believed to have qualities resembling those of quinine, and is valued as a febrifuge. The fruit is a remedy for coughs and asthma, and the seeds for jaundice, colic, and opthalmia. The pulverised fruit is employed as snuff, and to cure skin-diseases. The seeds are sometimes used to stupefy fish before catching them.

The tree is a native of the west coast of India, Ceylon, the Andamans, and the Sunderbans. It grows on the banks of rivers, ditches, and backwaters, along which it is distributed by its floating fruits, which germinate when they are stranded on the water's edge. It is a very handsome tree owing to its fine evergreen foliage and beautiful hanging clusters of flowers, which keep the ground beneath them covered with pink blooms throughout the hot season and the early part of the rains. The tree is not wild near Calcutta but is occasionally planted in gardens. A fine specimen may be seen in the Royal Agri-Horticultural Gardens at Alipore (in 1942).



*BARRINGTONIA RACEMOSA*

**Barringtonia acutangula** Gaertn.

(Acutangula means "with sharp edges", in allusion to the shape of the fruit).

| | |
|---|---|
| Bengali, | *hidjal, kumia, samundar.* |
| Hindi, | *neora, jujar, ijal, samundar phul, panniari, ingar.* |
| English, | *small Indian oak, Indian oak.* |

(F.I. p. 446. F.B.I. Vol. II. p. 508. B.P. Vol. I. p. 493.)

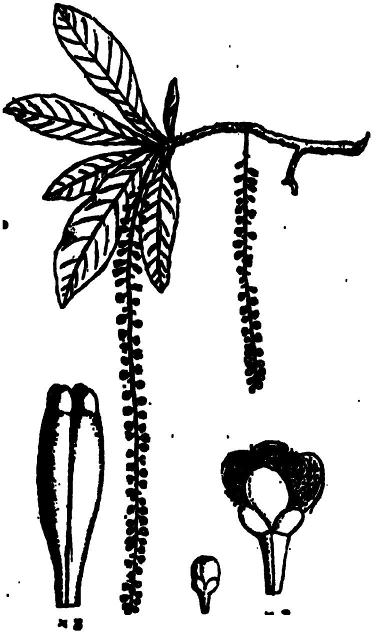
A middle-sized, glabrous tree; leaves obovate, oblanceolate, or cuneate-elliptic, minutely denticulate, 2 to 5 inches long; petiole about 1/5 inch long; flowers red or pink, about 1/3 inch diam., in long slender pendulous racemes 6 to 15 inches long; pedicels very short; calyx-segments 4; petals ¼ inch long; filaments long, red or pink; fruit quadrangular, oblong, broadest in the middle, 1 to 1½ inches long, angles rounded.

This is an evergreen tree of moderate size with thick, dark brown, rough bark, and spreading branches, which give it the general appearance of an English oak (*Quercus Robur* Linn.).

The leaves are smooth, rather narrow, broadest near their tips, and narrowed gradually to a very short stalk ; for the most part they are clustered near the ends of slender, greyish twigs, and their edges are minutely toothed. In the hot weather many small, red or pink flowers grow in long pendulous spikes, which hang vertically from the branches, the numerous stamens being the most conspicuous part of the flowers. The fruits are smooth, widest in the middle, and have four rounded angles, each fruit containing a single seed.

The wood is white, shining, and soft, weighing on the average about 39 lb. per cubic foot. It is more durable than it appears to be and is used for boat-building, wells, carts, cabinet-making, and the internal fittings of railway carriages. It is said to turn black when buried in mud.

The fruit is bitter and astringent, and is used medicinally to cure colic, nasal catarrh, and several other diseases. The root is supposed to have qualities similar to those of quinine, and is valued as an emetic and as an external application in colds. The juice of the leaves is considered a remedy for diarrhoea.



*BARRINGTONIA ACUTANGULA*

The bark is employed to intoxicate fish before catching them, and also for tanning.

This tree is a handsome and conspicuous object when its long tassels of pink or red flowers appear in April and May ; and at almost all times it forms an excellent shade-tree, though it does not attain a good height. It is indigenous in Australia, Malaya, and most parts of India, and is common in lower Bengal, though not particularly so in the neighbourhood of Calcutta. A few specimens are planted in the city as avenue trees, one of which may be seen (in 1944) on the west side of Cathedral Road near the

Victoria Memorial. In its wild state the tree usually grows on the banks of streams and ditches. The new foliage is mostly produced in March and April, at the same time as the flowers or just before they open.

**CAREYA**, (Named after Rev. William Carey, D.D., the founder of the Royal Agri-Horticultural Society of India). A genus of 4 species, natives of Australia and India, of which 3 are trees and 1 a small shrub. The leaves are not arranged in opposite pairs. The calyx-lobes and petals number 4 each. The numerous stamens are arranged in several whorls, but are united at the base into a fleshy ring, the stamens of the outer and inner whorls having no anthers. The fruits are large and spherical, containing numerous seeds embedded in fleshy pulp.

*Careya herbacea* Roxb. is a small undershrub with beautiful purple or pink flowers, not uncommon in dry jungles in some parts of the Bengal plains.

**Careya arborea** Roxb.

(Arborea is Latin meaning "like a tree".)

| | |
|---|---|
| Bengali, | *kumb, kumbi, kumhi, kamba, vakumba.* |
| Hindi, | *kamba, khumbi, kumbh, vahamba.* |
| English, | *wild guava, slow-match tree.* |

(F.I. p. 447. F.B.I. Vol. II. p. 511. B.P. Vol. I. p. 492.)

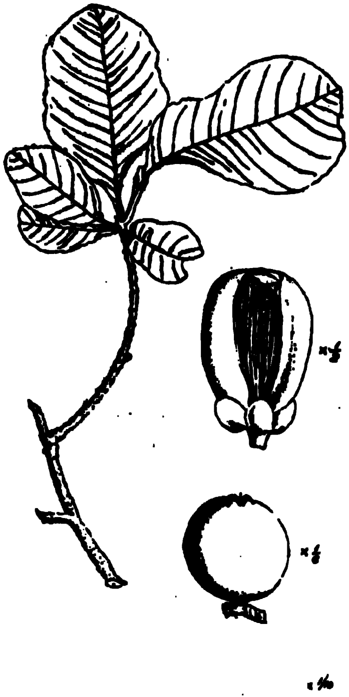
A large, deciduous tree; leaves obovate, crenate, obtuse or shortly acuminate, glabrous, about 12 inches long, narrowed at the base; petiole short; flowers 2 to 4 inches diam., a few clustered at the ends of branchlets, sessile; petals 4, greenish, elliptic, 1 to 2 inches long; filaments very numerous, equalling or exceeding the petals, pink or purple, on a deciduous ring; fruit green, globose, 2 to 3 inches diam.

This is a tall, stout tree with thick, dark grey bark, which peels off in narrow flakes and is reddish and fibrous within. The large smooth leaves are set on short stalks more or less clustered at the end of the twigs; they are broadest near the tip and taper towards the base, their edges being finely notched, with rounded teeth. The large pink and white flowers grow in small clusters at the ends of the branches; each has a bell-shaped calyx with four lobes, and four greenish petals surrounding a mass of long pink or red stamens, which are arranged in several circles and at the base are all attached to a large fleshy ring that soon falls to the ground together with the stamens. The fruit resembles a large green apple, having a pit at the summit surrounded by the lobes of the calyx, and contains numerous seeds set in a quantity of fleshy pulp.

The foliage of this tree is reminiscent of that of *Terminalia Catappa*, the *deshi badam*, or Indian almond, but the leaves are very much larger. They fall towards the end of the cold weather but sometimes the branches are not bare till the end of March or even later ; as in the case of the *deshi badam*, they turn a brilliant red or orange colour before they drop. The flowers appear in March and April on the almost bare branches, and are closely followed by the new leaves. The blooms are not conspicuous when on the tree, owing to their height from the ground, but the large rings of red or pink stamens carpet the ground beneath. A very unpleasant smell is emitted by the flowers, which attracts large numbers of flies, but birds seem to play a big part in the pollination. The fruits ripen about July.

The wood is fairly hard, even-grained, and durable, weighing about 50 lb. per cubic foot. It is used for making agricultural implements, hoops, carts, house-posts, and furniture. It is specially durable under water, and is very flexible.

The bark is collected for tanning ; it also yields a good coarse fibre for cordage, and fuzes made from the fibre are (or used to be) employed as slow-matches. In some parts of India the fibre is (or was formerly) woven to make the clothes of Hindu religious mendicants. The bark is said to be used by hunters to attract wild pigs. The leaves are a food for the tassar silk moth, and are employed in Burma to wrap up cheroots.



CAREYA ARBOREA

The fruits are eaten by the Santhals and by people in the Punjab, but the seeds are considered to be rather poisonous. Medicinally the fruit, as well as the bark, is used as an astringent to cure a variety of ailments. The flowers are soaked in water to yield a mucilage, which is given as a demulcent in coughs and colds. The fresh bark is believed to be a remedy for snake-bite, and the roots, bark, and leaves are sometimes thrown into streams and ponds to kill fish.

The tree is a native of most of the warmer parts of India, where it is commonly found in valleys and moist forests. It is not indigenous near Calcutta, but is occasionally planted in gardens. A fine specimen may be seen (in 1944) at the western end of the large tank in the Belvedere garden, and another on the Barrackpore Road near the Agarpara Jute Mill.

**GUSTAVIA.** (Named after King Gustavus III of Sweden, 1691-1759). A genus of about 20 species of trees and shrubs, natives of tropical America. The leaves are large, not arranged in opposite pairs, and have toothed edges. The flowers are large and showy with a top-shaped calyx, 6 to 9 nearly equal petals, and many stamens forming a ring or cup. The fruit is a fibrous berry containing a few seeds.

In addition to the tree described below several shrubs of this genus are occasionally cultivated in India for their very beautiful flowers. All are rare and delicate plants. *G. insignis*, a small shrub with pink flowers up to 6 inches across, is the best known.

**Gustavia augusta** Linn.

(Augusta is Latin meaning "majestic".)

English, *stink-wood.*

(Not in F.I., F.B.I. & B.P.)

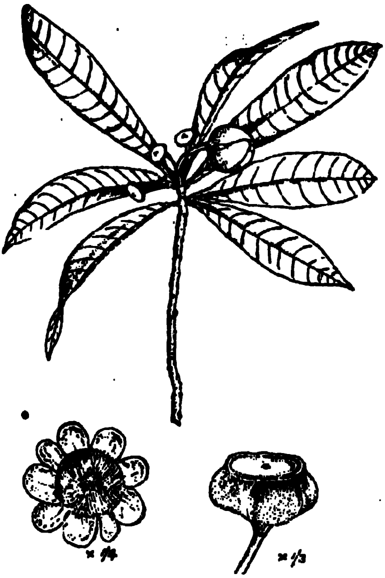
A small evergreen tree; leaves clustered at ends of branches, subsessile, elliptic or oblanceolate, acuminate, acute, irregularly serrate or crenate, glabrous, shining, up to 20 inches long by 5 inches wide; flowers in terminal cymes of 2 to 4, hermaphrodite, epigynous, regular, about 4 inches across when open; calyx turbinate, lobes obsolete; petals about 7, obtuse, pink or almost white, about 2 inches long; stamens many, united for 1/3 of their length, incurved, anthers pale yellow; fruit irregularly obconic, depressed at apex, about 2 inches wide.

This is a small bushy tree, branching from near the base, with fairly smooth, brownish-grey bark, and evergreen foliage. The large, pointed leaves are set in clusters at the ends of the branches and have practically no stalks; they are smooth and shining, and their edges are irregularly notched or toothed. The showy, pink or almost pure white, scented flowers grow in small clusters at the ends of the branches surrounded by the leaves. Their large, curved petals number from six to eight, and are set in two whorls, those in the outer whorl being rather bigger than those in the inner. Within the petals are several whorls of stamens, which have whitish filaments and yellow or orange anthers, and curve inwards over the stigma. The fruit consists of a hard, greenish berry, narrowed to the base from a broad, depressed, more or less circular top.

The flowers of this tree are reminiscent of water lilies, and the foliage is not unlike that of magnolias. The flowers are extremely handsome individually, though they are not produced in sufficient numbers to make the tree showy in the distance. Their scent is delightful, but the tree itself has an evil smell, which justifies its English name.

This tree is a native of tropical America. It deserves much more attention than it has received, and is only occasionally found in Indian gardens. It is fairly easy to propagate by layers and from seed, and grows well in Bengal when established.

The new leaves appear with the first flowers in April, and are reddish at first but soon turn green. The flowers continue till about August. The fruits ripen rapidly.



*GUSTAVIA AUGUSTA*

**COUROUPITA.** (A South American vernacular name). A genus of about 9 species, natives of tropical America. The leaves are not arranged in opposite pairs and are more or less oblong. The large and peculiar flowers are often borne on the trunk and larger branches. The calyx-tube is top-shaped, and the 6 petals are unequal. The numerous stamens are arranged in 2 sets, one series forming a ring or cup round the ovary, and the other joined to a form a palm, or ladle, rising from one side and curled over the ovary. The fruit is a large spherical berry, containing several seeds set in soft pulp.

**Couroupita guianensis** Aubl.

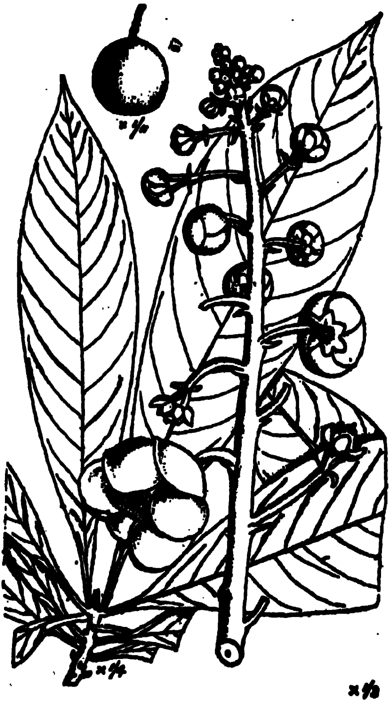
(Guianensis means "of Guiana".)

| | |
|---|---|
| Bengali, | *nagalingam.* |
| Hindi, | *shivalingam.* |
| English, | *cannon-ball tree.* |

(Not in F.I., F.B.I. and B.P.)

A tall tree ; young parts pubescent ; leaves alternate, oblong-obovate, elliptic, or broad-lanceolate, acute, often acuminate, subglabrous, about 5 inches long ; petiole short ; flowers about 3 inches diam., in racemes 2 to 3 feet long from the lower part of the trunk ; calyx turbinate, lobes rounded ; petals 6, subequal, concave, about 2 inches long, deep pink within ; fertile stamens numerous, on a process which recurves above the ovary ; barren stamens surrounding the ovary ; fruit hard, spherical, brown, up to 8 inches diam., (but less in Bengal).

This is a tall, evergreen, soft-wooded tree with a stout straight trunk and very rough brownish-grey bark. The rather narrow, pointed leaves are mostly clustered near the ends of the somewhat short branches, and are usually widest near their apex and taper to their short stalks. The tree is remarkable owing to its habit of bearing its large and peculiar flowers on short leafless twigs springing from the lower part of its trunk. Each flower grows on a short stalk and has six concave petals, which are a pleasing mixture of white, yellow, and pink outside, and of deep pink or crimson within. The stamens that bear the pollen are grouped on the lower side of a fleshy band, or ladle-like appendage, which rises from one side of the flower within the petals and curves back over the ovary and style. Other barren stamens without pollen are grouped round the ovary at the foot of the band of fertile stamens. The fruits are large, hard, brown, spherical berries which hang from the trunk and give excellent reason for the common name "cannon-ball tree". When ripe they contain cream-coloured pulp, which, when the fruit is opened, soon turns to a verdigris-green, giving off a strong smell like that of sulphuretted hydrogen.



*COUROUPITA GUIANENSIS*

The curious arrangement of the stamens is apparently an adaptation to ensure pollination of the flower by its own pollen in the event of the more desirable pollination by that of another flower not being achieved. If the band that bears the fertile stamens is pressed down from above, pollen may be transferred to the style; but if the flower is not fully open, a petal is likely to be interposed so that no pollen will reach the style, and a further chance of cross-fertilisation by pollen brought by an insect from another flower, or possibly from another tree, will remain. Eventually however, when the flower withers, the band carrying the stamens automatically closes down on the style, and so self-pollination is ensured if cross-pollination has not already been accomplished.

Owing to its rather ungainly shape and the uncouth manner in which the flowers grow from the trunk, this tree cannot be regarded as an object of beauty, in spite of its large and prettily coloured flowers. However, it is undoubtedly a curiosity and is frequently planted in tropical countries for this reason. The flowers appear throughout the hot season and the fruits ripen during the rains. The new leaves are produced mostly in March and April, but the foliage is changed several times during the year.

In its native country, tropical South America, the shell of the fruit is made into utensils. The pulp of the fruit is eaten by the natives, and is used for making beverages. The timber is said to be good, but in Bengal it seems to be very soft and to have a smell worse than that of the fruit.

Specimens of this curious tree may be seen (in 1944) on the northern side of Dalhousie Square, in the Eden Gardens, and the Royal Agri-Horticultural Gardens in Alipur. The flowers are not borne in much profusion, nor do the fruits attain nearly their maximum size in the climate of Bengal.

Hindus see in the stamens and the ovary the many-headed cobra brooding over the lingam-stone.

## LYTHRACEAE

A family of about 21 genera with over 350 species of trees; shrubs, and herbs found in all parts of the world. The leaves are not divided into separate leaflets, have smooth edges, and are usually set in opposite pairs. The calyx segments do not overlap when in bud. The petals are of the same number as the calyx-segments, and overlap one another in bud. The stamens are inserted on the calyx-tube, and are usually double the number of the calyx segments. The ovary is usually not attached to the calyx but is situated in a cup-shaped structure (hypanthium) on the rim of which the calyx and petals are borne (perigynous). The fruit contains many seeds.

This family is named after the genus *Lythrum*, which includes *L. Salicaria* Linn., the purple loosestrife, a herb of damp places in Britain. As well as by the trees described below, the family is represented in Bengal by a number of weeds belonging to the genus *Ammannia*; of which the most common is *A. baccifera* Linn., (Bengali, *dad mari*.)

The family is usually considered to include the genus *Punica*, though this genus is often held to constitute a separate family *Punicaceae*, because its ovary is completely joined to the calyx. The genus *Punica* contains only 2 species, of which one is *P. Granatum* Linn. (Bengali, *dalim*), the pomegranate. This is a shrub or small tree widely cultivated in some parts of India for its fruit, but in Bengal only occasionally planted in gardens, where it never exceeds the size of a shrub. It has large and beautiful scarlet flowers about 2 inches wide and blunt leaves about 2 inches long; its fruits seldom come to perfection in the damp climate of Bengal.

**LAGERSTROEMIA.** (Named after M. Lagerstroem, a Swedish patron of science, 1691-1759). A genus of about 25 species of trees and shrubs of Africa, Asia, and Australia. The leaves are usually set in opposite pairs in two rows, and have smooth (entire) margins. The calyx-lobes and petals usually number 6 each, and the petals are wrinkled or crisped. Of the numerous stamens, 6 are often larger and stouter than the others. The fruit is leathery and splits open into from 3 to 6 valves to release the numerous winged seeds.

In addition to the trees described below *Lagerstroemia indica* Linn., (Bengali, *telinga china*), the crepe myrtle, is very common in Indian gardens. It has leaves about 2 inches long and white, pink or mauve flowers up to 2 inches across. In suitable climates it may attain the size of a small tree but in lower Bengal is never more than a large shrub. Several named varieties are cultivated, and a hybrid type, known as *L. Lancasteri*, with large lilac-coloured flowers is one of the most beautiful of all Indian garden shrubs.

**Lagerstroemia speciosa** (L.) Pers. *Syn.* L. Reginae *Roxb.* L. Flos-Reginae *Retz.*

(Speciosa is Latin meaning "beautiful". Flos-Reginae is Latin meaning "queen's flower". Reginae means "of the queen").

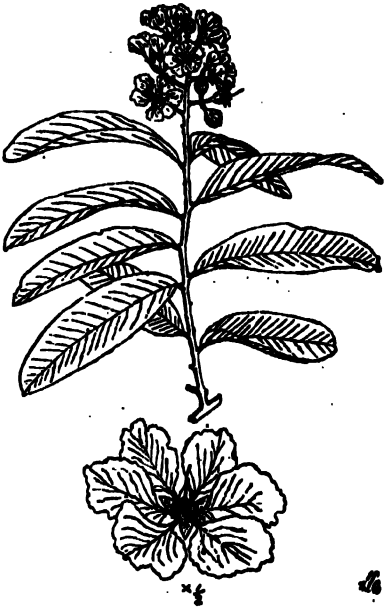
| | |
|---|---|
| **Bengali,** | *jarul.* |
| **Hindi,** | *jarul, arjuna.* |
| **English,** | *queen flower, pride of India, crepe-flower.* |

(F.I. p. 404. F.B.I. Vol. II. p. 577. B.P. Vol. I. p. 504.)

A large, deciduous tree; leaves glabrous, opposite or sub-opposite, elliptic or lanceolate, 6 to 8 inches long; petiole stout, ¼ to ⅜ inch long; flowers 2 to 3 inches wide, in ample terminal panicles; calyx tomentose, 12-ribbed, segments 6, long-triangular; petals 6, 1 inch long or more, clawed, margins erose-undulate; stamens equal; calyx in fruit thickened, woody; capsule broadly ovoid, septifragally 5-6-valved, ¾ to 1 inch long, woody; seeds angular, about 1/3 inch long, winged.

This is a tall tree, (though it often flowers when only twenty feet high), usually with a short bole and big branches covered with smooth, greyish or cream-coloured bark, which peels off in broad irregular flakes. The leaves are rather variable in shape, but are always somewhat narrow, hairless, and set on short, stout stalks in opposite or nearly opposite pairs, in two rows on either side of the twig. The large and beautiful flowers grow in wide, stiff, open clusters at the ends of the branches. Each flower has a calyx covered with white or rust-coloured hairs, and divided into six triangular segments. The six petals are more or less round in outline with wavy crinkly edges, and are attached to the calyx by narrow stalks; they are usually of a brilliant lilac colour, but have a tendency to fade as they get old. The stamens are numerous, but much shorter than the petals, and are all equal in length ; they are purplish in colour with yellow anthers. The fruit is a woody, egg-shaped pod containing a number of winged seeds.

The jarul is one of the most important of Indian timber trees, especially in Bengal, and, when its magnificent flowers are open, it is certainly one of the most beautiful trees to be found in the whole country. The leaves usually turn reddish or copper-coloured during the cold season and fall off gradually, until the new foliage appears in March or April. The flowers mostly appear from April to June and are usually over soon after the rains break, but sometimes young trees may be seen flowering towards the end of the rains. The fruits are often borne in great profusion ; they ripen from November to January but open to scatter their seeds rather later and remain on the tree a long time, so that black fruits of the previous year may be seen on the tree together with green fruits of the current year. The flowers vary in colour, and a very beautiful variety with large cerise flowers is occasionally cultivated.



*LAGERSTROEMIA SPECIOSA*

The wood is light red in colour and hard, and weighs about 40 lb. per cubic foot. It is strong and fairly durable, and is used for a great variety of purposes including house-construction, and boat-building. The tree may be considered the principal timber tree of north-east India, but unfortunately all the timber sold as "jarul" is not the wood of this tree.

Medicinally the root is astringent and is considered a stimulant and febrifuge. The bark and leaves are purgative and the seeds narcotic.

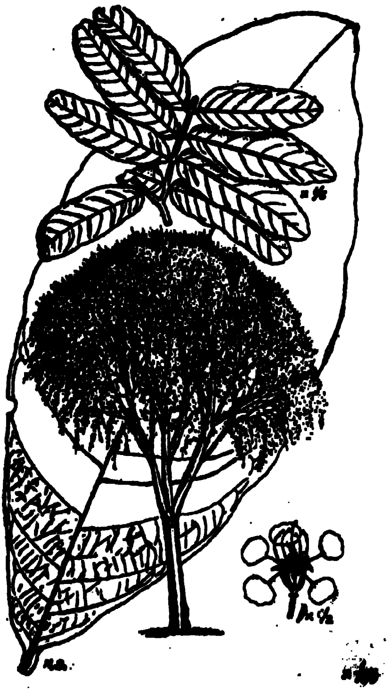
The tree is a native of China, Malaya, and most parts of India, where it grows principally in damp places near rivers. It is not apparently wild near Calcutta, but is commonly planted in gardens, and in streets as an avenue tree. Its lilac flowers, mingled with the yellow of *Peltophorum inerme* and the orange of *Delonix regia,* make some of the streets of Calcutta in the month of May perhaps the most gorgeous in the world.

**Lagerstroemia Thorellii** Gagnep.

(Not in F.I., F.B.I. and B.P.)

A medium-sized tree; leaves opposite, elliptic, obtuse, about 4 inches long by 2 inches wide, glabrous; petiole 1/5 inch; flowers about 1¼ inch diam., in copious axillary panicles; calyx tube 12-ribbed, stellately tomentose, lobes short, recurved; petals 6, undulate, orbicular, narrowed to a short claw, about ½ inch wide and long, mauve fading to white; fruit ovoid, ½ inch long, seeds about 1/3 inch long, winged.

This is a tree of moderate size with a short trunk, a bushy crown, and pale yellowish-grey bark, which peels off in irregular patches. The leaves are narrow with blunt points, and are set on very short stalks in opposite pairs in two rows on either side of the twig. The flowers grow in large, open clusters from near the bases of the leaves; they are purple or lilac-coloured when they first open, but soon fade to an almost pure white. Each has a calyx covered with fine down, and six almost round, crinkly petals attached to the calyx by slender stalks. The small, brown, egg-shaped fruits are borne in profusion and ripen during the cold weather, each containing a number of seeds with narrow wings.



*LAGERSTROEMIA THORELLII*

This tree is not unlike *L. speciosa,* the jarul (see above), but has much smaller leaves and flowers; moreover its flowers are less brilliant in colour even when they first open, and rapidly fade through mauve to a very pale shade. However, the tree does not compete with its more splendid relative because its flowers open after the break of the rains, when the jarul flowers are over, and continue till October, giving a fine display of bloom throughout the monsoon months.

Cochin-China is the native habitat of this tree. It has only recently been introduced into Calcutta, but is now common in gardens and is occasionally planted in streets as an avenue tree.

The leaves fall during the cold season and are replaced in February and March, the new foliage often being reddish in colour.

**LAWSONIA.** (After John Lawson, who published in 1709 an account of his travels in North Carolina). A genus consisting of one variable species, indigenous in Arabia and Persia. The ovary is not attached to the calyx, the petals and sepals number 4 each, and the stamens 8. The fruit bursts open irregularly.

**Lawsonia inermis** Linn. *Syn.* L. alba *Lam.*

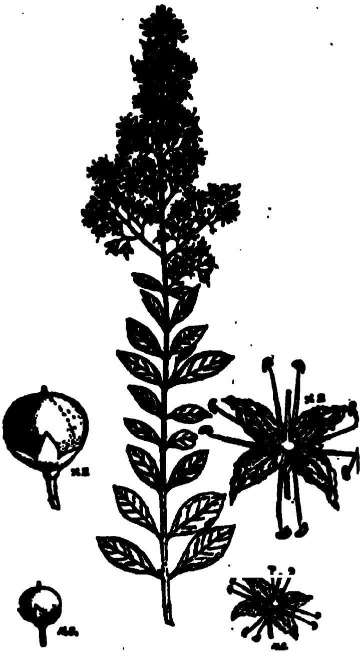
(Inermis is Latin meaning "unarmed" i.e., "thornless". Alba is Latin meaning "white".)

| | |
|---|---|
| Bengali, | *mendi.* |
| Hindi, | *mehndi.* |
| English, | *henna, mignonette tree, Indian privet, Egyptian privet, camphire* (of the authorised version of the Bible.) |

(F.I. p. 325. F.B.I. Vol. II. p. 573. B.P. Vol. I. p. 502.)

A large shrub or small straggling tree, unarmed or thorny; leaves opposite, elliptic, acute, up to 1¾ inches long, glabrous, petiole very short; flowers in dense terminal panicles, fragrant, usually cream-coloured; corolla ¼ inch diam.; sepals 4; petals 4; stamens 8, much longer than the petals; fruit green, then red when young, ultimately dry, dehiscing irregularly, depressed-globose, ¼ inch diam.; seeds angular, smooth.

The henna is a small straggling tree, or more often a large shrub, with rusty-brown, fairly smooth bark, and numerous irregular branches, some of which often spring from the base of the plant. The small, hairless, pointed, greyish-green leaves are arranged in opposite pairs on very short stalks along the many fine twigs. The fragrant flowers grow in dense, much-branched clusters at the ends of the branchlets. Each flower has four minute green sepals, four petals, and eight stamens, which greatly exceed the petals in length and form one of the most conspicuous parts of the flower. The petals are usually greenish-white, but varieties with reddish flowers are not uncommon and a beautiful variety with clear pink flowers is sometimes found in Indian gardens. The small hard, spherical fruits are borne in great profusion, and their clusters weigh down the ends of the branches that bear them. At first the fruits are green and shining, but they soon turn reddish, and ultimately become hard, dry, and brown, when they burst open by irregular splitting to release their seeds. Usually the plant is devoid of thorns, but when grown on poor soils or under adverse conditions it sometimes bears spines at the ends of the branches.



*LAWSONIA INERMIS*

The small shining leaves of the henna are reminiscent of the privets (*Ligustrum spec.*) that are so much used for hedges in temperate countries, and the scented creamy flowers have a superficial resemblance to those of mignonette (*Reseda odorata* Linn.); hence some of the popular English names. The common name "henna" is from the Arabic.

The leaves of this plant yield the well-known dye much used in all countries for dying the hair a bright reddish colour, and in India for colouring the finger-nails, hands, and feet a dull orange. The leaves are pounded into a paste with lime or catechu and applied overnight to the nails or skin, which retain the colour for a long time. The plant is much used for these purposes by Muslim ladies, and also by *hajis* for dyeing their beards. A preparation of indigo is sometimes applied to hair which has first been dyed red by henna, resulting in a beautiful black colour. The tails and manes of horses are also sometimes dyed red by means of this plant.

The flowers are used in perfumery and in embalming. The leaves are sometimes employed in tanning and are exported to Europe for use in cosmetics. The wood is grey, hard, and close-grained; it is used for making tool-handles, tent pegs, and other small articles.

Henna has been regarded from the remotest times as a valuable medicinal plant. The ancients believed that the scent of the flowers was beneficial to invalids, and that the leaves were good for burns and ulcers. In India they are used principally as a remedy for ulcers, skin diseases, rheumatism, and "burning of the feet". They are also applied to any disease of the finger nails, and are made into an astringent gargle. The bark is given in jaundice and stomach-troubles, and is applied to burns and scalds, and a pulp made from the bark is a remedy for sore eyes. An infusion of the flowers is applied to bruises, and a pillow stuffed with them is said to have a soporific effect. The seeds are given internally in cases of delirium.

The henna has been a favourite garden plant in the East from time immemorial, and is the plant referred to in the Song of Solomon, "My beloved is unto me as a cluster of camphire in the vineyards of Engedi." It is much used for hedges in some parts of India, but in Bengal is usually met with as a tall shrub or a straggling tree attaining as much as twenty feet in height.

The flowers appear in May and June, and are followed by masses of fruit. Some of the fruits do not ripen and release their seeds until the tree is again in flower a year later. The new leaves are mostly produced in February and March.

## SAMYDACEAE

A small family of about 17 genera with about 200 species of trees and shrubs, all natives of tropical countries. The leaves are not arranged in opposite pairs, but are usually set in two rows on either side of the stem. The flowers are bisexual, but small and inconspicuous, having a leathery calyx with 3 to 7 lobes, and as many petals as the calyx-lobes, or sometimes no petals. The stamens are few or many, often alternating with barren stamens (staminodes). The ovary is not attached to the calyx and usually has 1 style. The fruit is generally a capsule containing several seeds, and opening by several valves.

The family is of little importance in India. It takes its name from the genus *Samyda*, which is represented only in tropical America. It has been united by some authorities with the *Bixaceae*, or *Flacourtiaceae*, from which it differs in having the ovary in a cup-shaped structure on the edge of which the sepals and petals are borne.

**CASEARIA.** (Named after a Dutch missionary and botanist in Cochin China of the 17th century, Johann Casearius). A genus of about 150 species, of which about 8 are found in India. The flowers grow in small clusters at the bases of the leaf-stalks, and have no petals. The fruit is succulent, and opens by 3 valves.

**Casearia tomentosa** Roxb.

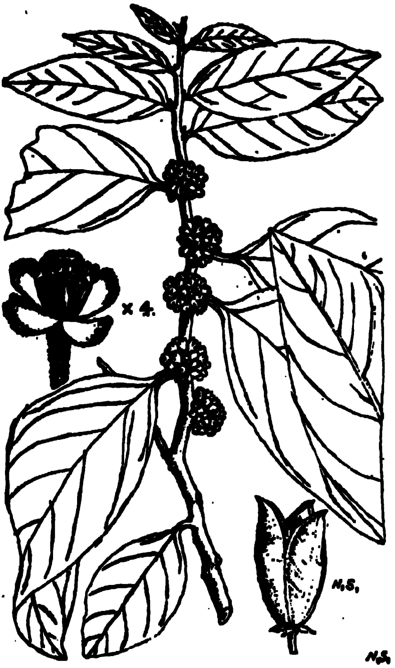
(Tomentosa is Latin meaning "densely covered with short hairs".)

Hindi, *baili, bheri, chilla, bhari, chilara.*

(F.I. p. 377. F.B.I. Vol. II. p. 593. B.P. Vol. I. p. 509.)

**A small tree; leaves oblong, acute, more or less serrulate, pubescent or tomentose beneath, base oblique, about 4 inches long, distichous; petiole about 1/3 inch; flowers greenish, about 1/3 inch diam., in axillary fascicles; calyx pubescent, lobes 5; petals 0; stamens 8 or 10, alternating with villous staminodes; fruit ellipsoid, smooth and shining, 3-valved, 6-angular, about 3/4 inch long.**

This small tree has an erect trunk covered with thick, ash-coloured bark, and spreading, almost horizontal branches. Its rather narrow, pointed leaves are more or less downy beneath, and have finely toothed edges; they are set on short stalks in two opposite rows on either side of the stem, and sometimes have a reddish tinge, especially just before they fall. The small greenish flowers grow in little, dense clusters at the bases of the leaf-stalks, along the whole length of the smaller twigs. Each flower has a five-lobed calyx and eight to ten stamens, but no petals. The fruit is fleshy and slightly elongated, and opens by three valves to release several seeds which are embedded in a soft, scarlet pulp.



*CASEARIA TOMENTOSA*

The wood is fairly hard and close-grained, but rough. It weighs about 40 lb. per cubic foot. It is said to be made into combs.

The bark is used for adulterating the red dye known as "*kamela*", which is obtained from the tree *Mallotus philippinensis* Muell.-Arg. The pounded fruits are compounded with mud and thrown into dammed streams to poison fish.

The bark is bitter, and is employed medicinally as an external application in dropsy. The leaves are used in medicated baths.

The tree is indigenous in almost all parts of the plains of India, and although it has not been reported wild in the neighbourhood of

Calcutta, it would not be surprising to find it occurring there spontaneously. A specimen grows (in 1944) on the boundary of the Belvedere Garden adjoining the Alipore Road.

The flowers appear from February to April. The leaves are changed in the cold weather.

# CARICACEAE

A small family, represented mainly by the genus *Carica*, comprising about 40 species of small trees with soft succulent stems and milky sap, nearly all natives of tropical and sub-tropical America. The leaves are large and various in shape. The flowers are usually unisexual, the male and female flowers sometimes being found on separate trees (dioecious). The 5 petals are joined for a part of their length to form a tube which is longer in the male flowers than in the female. The 10 stamens of the male flowers are attached to the petals in two whorls of 5. The fruit is a large berry containing numerous seeds.

The family was included by early authorities in the larger family *Passifloraceae*, the passion-flower family, from which it differs chiefly in the conjoined petals and double row of stamens. The true position of the *Caricaceae* in the system of classification is still somewhat doubtful.

**CARICA.** (The ancient Latin name for the fruit of a fig-tree, probably applied to this genus owing to the shape of the leaves, which somewhat resemble those of the edible fig-tree). The principal genus of the family with about 25 species, distinguished by fruit containing a single cavity lined by numerous seeds.

**Carica Papaya** Linn.

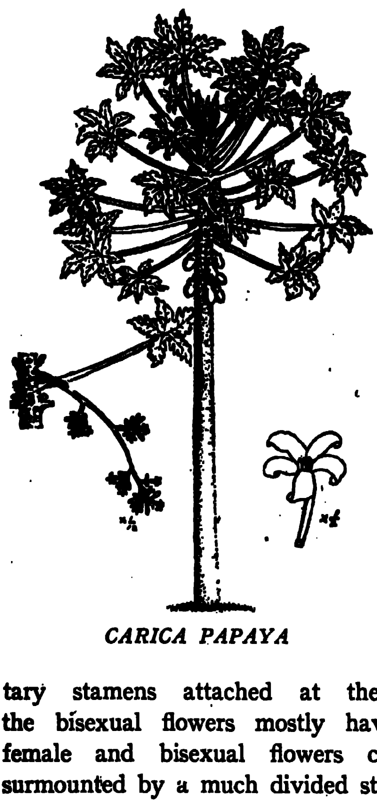
(Papaya is a corruption of a Carib name.)

| | |
|---|---|
| Bengali, | *pippiya, pepiya, papeya, pepe.* |
| Hindi, | *papaya, papita.* |
| English, | *papaw, papaya, melon-tree.* |

(F.I. p. 736. F.B.I. Vol. II. p. 599. B.P. Vol. I. p. 514.)

A small soft-wooded tree, with milky juice, often unbranched; leaves clustered at the top of the stem, glabrous, palmatifid, 12 to 24 inches long; petioles long, hollow; flowers pale yellow, fragrant, polygamous, dioecious, or monoecious; female and hermaphrodite flowers in short cymes, or solitary on short peduncles, among the leaves; male flowers in long drooping panicles; stamens in male flowers 10; calyx short, greenish; corolla of female flower polypetalous, of male flowers tubular with 5 narrow lobes, of bisexual flowers intermediate; stigma sessile, 5-lobed, lacerated; fruit succulent, indehiscent, 1-celled, up to 15 inches long, irregular in shape, green or yellowish when ripe; seeds numerous, black, enclosed in sweet, soft pulp.

The papaya is a small, very quick-growing and short-lived tree with greyish bark and a soft, fleshy stem, which is usually unbranched but sometimes divides not far from the top into a number of more or less vertical branches. The large leaves are deeply divided into about seven lobes, which are again divided into several smaller lobes. The leaf-stalks are hollow and longer than the leaves, and are clustered near the top of the stem, so that the tree, especially when its stem is unbranched, might easily be mistaken at a little distance for a palm.



*CARICA PAPAYA*

The small, scented flowers have fleshy, yellowish or cream-coloured petals. There are two principal kinds of flower, male and female, but a number of intermediate bisexual forms also occur. The petals of the female flowers are scarcely joined together, but those of the male flowers are combined into a slender tube, at the mouth of which are five narrow lobes. The male flowers contain ten stamens, in two whorls of five each, attached to the mouth of the tube formed by the petals; the female flowers usually have five rudimentary stamens attached at the base of the petals, and the bisexual flowers mostly have five fertile stamens. Both female and bisexual flowers contain an egg-shaped ovary surmounted by a much divided stigma, the rays of which spread wider in the female flowers than in the bisexual flowers. The female and bisexual flowers are found on separate trees, or sometimes mingled on the same tree, and grow in small, short-stalked clusters on the main stem among the leaf-stalks. The male flowers grow in long, drooping sprays on separate trees, but occasionally female or bisexual flowers are found on a male tree, usually at the ends of the sprays. The fruits are mostly borne close to the main stem on the female and bisexual trees, but occasionally small fruits are found hanging on the ends of long stalks from the male trees.

The bisexual flowers assume various forms intermediate between the male and female flowers. Fruits formed from the bisexual flowers are often irregular in shape, but the fruits of female flowers are usually quite circular in cross-section. Some trees bearing bisexual flowers only bear fruits at certain seasons, the flowers at other seasons being sterile owing to the male element then being better developed than the female. As a result the stems of these plants have alternate regions of fertility and barrenness.

The large fruit is very variable in shape, but is not unlike a melon in both inward and outward appearance. It is green till quite ripe, and then usually yellowish in colour. Its very thin skin contains a quantity of yellow, orange, or pinkish pulp, which surrounds a hollow space lined by the numerous spherical black seeds. The taste of the pulp is peculiar, but fairly sweet and liked by most people, though some can only appreciate it when flavoured with sugar and lemon-juice, while by others it is eaten with pepper and salt. The seeds have a hot, pungent taste and are sometimes eaten.

The papaya is one of the most important fruit trees of Bengal owing to the ease with which it can be propagated from seed, the great speed of its growth (it will bear fruit in less than a year from the planting of the seed), and the wholesome nature of the fruits, which are appreciated by all classes of people. It is not only eaten when ripe, but the unripe fruit is made into curries and pickles, and boiled as a vegetable.

The milky juice of the tree contains a substance known as "papain", which has the property of making meat tender, and of helping its digestion. Indian cooks often wrap meat in the leaves of the tree, or place a piece of the unripe fruit in the water in which meat is boiled. Sometimes meat is hung on the tree overnight in order to soften it, and it is even said that if animals eat the seeds of the tree before they are killed, their meat will be tender. The juice containing papain is sometimes tapped from the green fruits and exported to America and Europe, where it is used in medicine, to make invalids' and children's foods, and in the manufacture of chewing-gum.

The ripe fruit is much used in Indian medicine, chiefly to cure digestive troubles and skin diseases. The milky juice of the unripe fruit is a remedy for freckles, and in Malaya is considered to be poisonous. The seeds and various other parts of the tree are used as a vermifuge, and there is a popular belief that the seeds cause abortion. A poisonous alkaloid has been extracted from the leaves and seeds, but is apparently of no practical value. The leaves are said to be gathered in the West Indies for washing clothes as a substitute for soap.

The tree is a native of the West Indies, but is now widely cultivated throughout the tropics, and is very common in gardens all over the plains of Bengal. The flowers appear at almost all times of the year, and the fruits ripen at all seasons. The trees bear fruit in profusion when in their prime, as many as fifty fruits being occasionally produced by one tree at the same time ; but after a life of about five years the trees become exhausted and should be replaced. A number of different varieties are grown but these do not seem to be clearly defined. Seedless varieties are occasionally found, and are much valued, but are difficult to propagate. The female trees sometimes bear their first fruits when only ten months old at a height of less than two feet from the ground.

Although the pollen from bisexual flowers is often enough to fertilise the female flowers, it is advisable to grow a few male trees in an orchard of female and bisexual trees. Unfortunately the male trees cannot be distinguished until they flower, with the result that a large proportion of useless male seedlings normally have to be planted and subsequently weeded out when their sex becomes apparent. It has been shown, however, by Messrs. Kumar and Abraham of the Poona Agricultural College (*vide* Journal of the Bombay Natural History Society, Vol. XLIV. No. 2 of December, 1943) that, by using the pollen of hermaphrodite flowers to fertilise female flowers, male seedlings can be eliminated.

## CORNACEAE

A small family of about 16 genera with 80 species, mostly shrubs, natives of all parts of the world. The leaves are not divided into separate leaflets and have smooth (entire) edges. The flowers are often unisexual, but always symmetrical, and have their calyx joined to the ovary. The petals number from 4 to 10, and are inserted round a disc. The stamens are usually as many as the petals but sometimes more. The fruit is a berry crowned by the calyx, containing one or two seeds.

The family takes its name from the genus *Cornus*, which includes *C. sanguinea* Linn., the cornel or dogwood, a common shrub in southern England.

**ALANGIUM.** (A latinized form of a vernacular name of Malabar). A genus of about 16 species or shrubs and small trees, natives of tropical Asia, Africa, and Australia. The leaves are not arranged in opposite pairs. The flowers are white and bisexual with long, narrow petals, and over 20 stamens. The fruit contains a single seed.

**Alangium salvifolium** (L.f.) Wangerin. *Syn.* A. Lamarckii *Thwaites.*
A. hexapetalum *Roxb.*

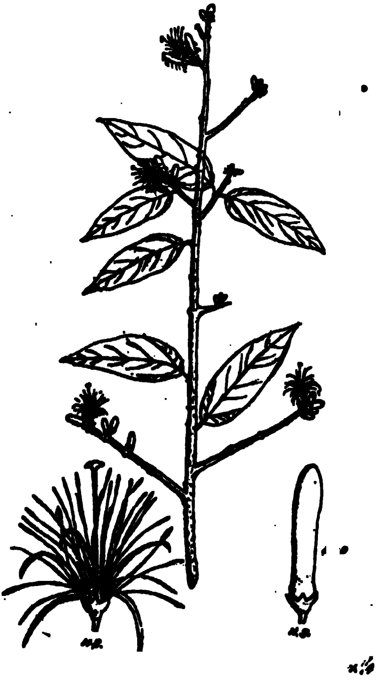
(Salvifolium means "with leaves like a *Salvia*". Lamarckii is in memory of Lamarck, the famous 18th Century French scientist, who first described this genus. Hexapetalum means "with six petals").

| | |
|---|---|
| Bengali, | *ankura, akar-kanta, bagh ankura.* |
| Hindi, | *akol, akola, ankora, ghaul, koeli, thaila.* |

(F.I. p. 404. F.B.I. Vol. II. p. 741. B.P. Vol. I. p. 545.)

A shrub or small tree, armed or not; leaves alternate, variable in shape 3 to 6 inches long, membranous, entire, pubescent when young, glabrous or pubescent beneath when mature; petiole about ¼ inch; flowers solitary or fasciculate, greenish white, scented; pedicels and calyx hairy; petals 5 to 10, usually 6, about 1 inch long, linear, hairy outside; stamens 20 to 30; fruit ellipsoid, smooth, black when ripe, about 2/3 inch long; seed enclosed in soft pulp.

This is a straggling shrub, or a small bushy tree with thick, greyish, fibrous bark, and slender branches, which usually bear thorns. The leaves vary greatly in shape, but are always borne on short stalks, not set in opposite pairs, and have smooth edges. When young they are covered with fine down, which sometimes persists on the lower sides of the leaves after they are mature. The rather small, greenish-white flowers grow either singly, or several close together, on very short stalks along the twigs; they are sweet-scented and have many stamens and about 6 long, narrow petals. The fruit is slightly elongated, smooth, and red or black when ripe; it contains a single seed enclosed in mucilaginous, sweet but rather astringent, red pulp.



*ALANGIUM SALVIFOLIUM*

The wood is hard and even-grained, with beautiful markings and a pleasant scent, weighing about 50 lb. per cubit foot. It is an excellent fuel and is used for making pestles, oil-mills, wooden cattle-bells, and for carving. It is said to be peculiarly suitable for producing sound and is made into various kinds of musical instruments.

The fruit is edible, but rather unpleasant in flavour.

The aromatic root-bark is used in Indian medicine as a purgative, an emetic, an anthelmintic, and to cure skin diseases. The fruit is considered laxative and useful in cases of fever and diseases of the blood. The leaves are prescribed for rheumatism and the seed for boils.

This common and very variable plant is a native of Africa, China, Malaya and most parts of India, especially dry regions. It does not appear to be indigenous in the damper parts of Bengal, but is often to be found there in village shrubberies. It is not uncommon in Calcutta gardens.

The flowers appear from February to April, and the new leaves in April and May. The plant is never quite leafless, but when the flowers appear the branches are almost bare of leaves, and then for a short period have considerable beauty. The fruits ripen in June and July.

## RUBIACEAE

One of the largest families of plants, comprising about 350 genera with about 5,000 species of trees, shrubs, and herbs, mostly tropical but extending into the arctic regions. The leaves are usually arranged in opposite pairs, but sometimes in whorls, and are accompanied at their bases by small appendages (stipules), which usually join the two opposite leaf-stalks, forming a sheath round the stem, but sometimes are placed between the leaf-stalk and the stem. The petals generally number 4 or 5, and are joined to form a tube, on the inside of which the stamens are borne, alternating with the petals. The ovary is wholly enclosed by, and attached to, the calyx (inferior); it usually contains 2 cavities (cells), each of which holds 1 or more seeds. The fruits take various forms. The flowers are sometimes joined into compact heads.

This important family contains many weeds common in the Bengal plains, and also a number of beautiful herbs and shrubs cultivated in Indian gardens. Among the latter are three or four species of *Mussaenda*, a genus of which the otherwise insignificant flowers have one of the five sepals much enlarged and brightly coloured. *Hamiltonia*, *Hamelia*, and *Rondeletia* are also well-known genera of ornamental shrubs commonly found in Calcutta gardens. *Catesbaea spinosa* Linn. is a large, slow-growing, evergreen shrub from the West Indies, with many straight spines as long or longer than the leaves, and very large, trumpet-shaped, pale yellow or cream-coloured flowers, which are produced in some profusion; the fruit is said to be edible; the plant is not uncommon in Calcutta gardens. The family also comprises *Coffea arabica* Linn., the coffee plant, which is largely cultivated in South India and other tropical countries, and the genus *Cinchona*, which yields quinine.

The family takes its name from *Rubia*, a genus of small creeping herbs including *R. peregrina* Linn., the wild madder, a common weed in the south-western counties of England.

**ANTHOCEPHALUS.** (From the Greek "anthos", a flower, and "kephalos", a head, in allusion to the compact heads of flowers). A genus of 3 species of trees, natives of India and Malaya, with small flowers collected in compact spherical heads. The 5 petals are partially joined to form a long funnel-shaped tube, on the interior of which the 5 stamens are borne; the free parts of the petals overlap in the bud. The fruit is composite, consisting of a fleshy mass on which are inserted the numerous fruits of the individual flowers, each containing numerous seeds without wings. The genus differs from *Nauclea* principally in that the ovaries of the flowers are separate in the case of *Anthocephalus*, whereas in the case of *Nauclea* they are completely joined into a compact head.

Only one species of this genus is found in India.

**Anthocephalus indicus** A Rich. *Syn.* A. Cadamba *Miq.* Nauclea Cadamba. *Roxb.*

(Indicus means "of India". Cadamba is a latinized form of the common Indian name for this tree).

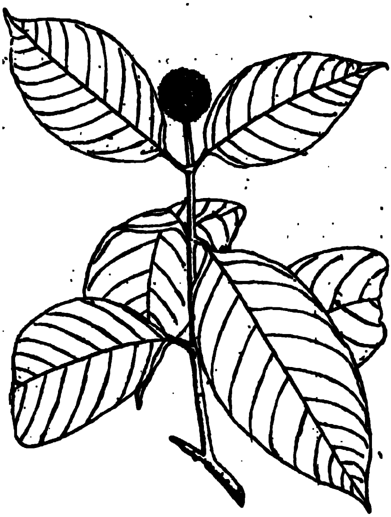
| | |
|---|---|
| Bengali, | *kadam.* |
| Hindi, | *kadam, kadamb, karam.* |

(F.I. p. 172. F.B.I. Vol. III. p. 23. B.P. Vol. I. p. 551.)

A large deciduous tree; leaves elliptic-oblong or ovate, acute or shortly acuminate, coriaceous, shining and glabrous above, pubescent beneath, 5 to 9 inches long, (much larger in young plants); petiole 1 to 2 inches long; stipules small, linear, caducous; flower-heads solitary, terminal, globose, 1½ to 2 inches diam.; peduncles 1 to 1½ inches long; calyx lobes oblong, persistent; corolla glabrous, orange; ovaries not confluent, 4-celled above, 2-celled below; pseudocarp large, fleshy, orange, 2 to 2½ inches diam.

The kadam is a tall tree, having a perfectly straight trunk with fairly smooth bark marked with numerous longitudinal cracks and peeling off in small rectangular scales. Its branches are horizontal with a tendency to droop, and they form a dense rounded head of foliage. The rather narrow, pointed leaves are set on stalks of moderate length in opposite pairs; above they are dark glossy green with paler veins, but below they are lighter in colour and are usually covered with fine down. Many small scented flowers are combined in compact spherical heads, each of which grows on a short stalk at the end of a twig. The calyx is pale greenish or cream-coloured, and when the flowers are in bud, the heads have the colour of the many minute calyces with which they are covered. The petals, however, are orange, and as they grow outwards beyond the calyces the heads become compact orange spheres a little smaller than a golf ball; but the stigma (the organ at the top of the ovary which receives the pollen) is white, and when the petals open the heads increase in size and for a time assume the dull white colour of the many projecting stigmas. The small fruits of the individual flowers are not joined together, but are all inserted in a central fleshy mass which forms a composite fruit, and turns brownish or yellowish when ripe, attaining the size of a billiard ball.

This very beautiful tree is much admired for its golden balls of flowers, and for their delicate scent, which is reminiscent of the flowers of *Scabiosa*, but sweeter. It is often planted near houses and on roadsides as a shade tree, and is very suitable for this purpose owing to the dense shade given by its handsome foliage, its straight trunk, and stately outline.



*ANTHOCEPHALUS INDICUS*

The fruits are acid but pleasantly flavoured and are eaten both cooked and raw, though they are said to have a bad effect on the digestion. They are much eaten by various animals, which so help to distribute the minute seeds. Fruit bats are so fond of them that the ground beneath the trees gets much messed up and for this reason it is not advisable to plant the trees near houses.

The wood is white, soft, and even-grained, weighing about 40 lb. per cubic foot. It is much used for making boxes, beams, rafters, and similar objects, but is considered brittle and of inferior quality. The foliage is sometimes lopped for cattle fodder.

Medicinally the bark is prescribed as a febrifuge and tonic, and is given to babies when their fontanels sink. A decoction of the leaves is used as a gargle.

Hindus offer the flowers at shrines, and the tree has several religious and mythological associations, frequent references to it being found in Sanskrit literature. It is closely connected with the life of Sri Krishna, who is often depicted standing together with his devotee Radharani beneath a kadam tree in full bloom. The goddess Shakti is supposed to pass her time in a garden of these trees. It is said that the tree of Buddha sprang from a kadam seed and grew to an enormous size in a moment. The ancient Hindus compared the scent of kadam flowers to the smell of new wine, and believed that they had the power to recall absent lovers.

The tree is indigenous in most of the hotter parts of India as well as in China and Malaya. In Bengal it is usually planted but occasionally occurs spontaneously. It is commonly grown in Calcutta streets and gardens.

The flowers appear from June to August and the fruits ripen towards the end of the rains. The leaves of saplings are much larger than those of the mature tree.

**NAUCLEA.** (From the Greek meaning "a little ship"). A genus of about 13 species of trees and shrubs, natives of tropical Africa and Asia. The flowers are combined in dense spherical heads, and the fruits are joined into one composite fleshy mass, each fruit containing a number of seeds without wings. The flowers are small, the 4 or 5 petals being joined at the base to form a narrow tube at the mouth of which the stamens are borne; the free parts of the petals overlap in bud.

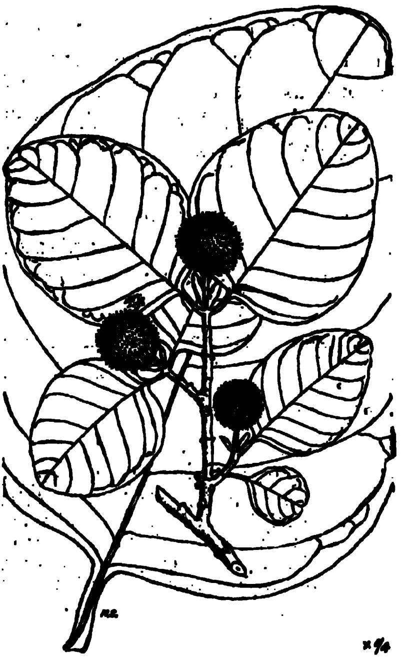
**Nauclea orientalis** Linn. *Syn.* Sarcocephalus cordatus *Miq.*

(Orientalis is Latin meaning "eastern". Cordatus means heart-shaped, in allusion to the shape of the leaves.)

(F.B.I. Vol. III. p. 22. Not in F.I. & B.P.)

A middle-sized tree; leaves broadly ovate or cordate, often hairy beneath, obtuse, 3 to 7 inches long; petiole 1 inch; stipules interpetiolar, obtuse, ½ to ¾ inch long; peduncles solitary, stout, 1-headed, 1 to 1½ inches long; heads ½ to 1 inch diam., drooping, fragrant; corolla ¼ inch long, glabrous, orange or yellow, lobes obtuse; ovaries confluent, 2-celled; pseudocarp fleshy, depressed-globose, 1 inch diam.

This is a tree of moderate size having a short straight trunk covered with thick, smooth, light-greyish bark, and a bushy head. The rather large, broad leaves are set in opposite pairs on stalks of moderate length; they are usually more or less heart-shaped and covered with minute hairs on the lower side. Many small, orange or yellow, scented flowers grow together in compact spherical heads, each of which is borne on a short drooping stalk. The fruit is composite, consisting of the numerous fruits formed by the individual flowers all combined into one fleshy mass containing a large number of minute seeds.



*NAUCLEA ORIENTALIS*

The wood is soft and weighs only 35 lb. per cubic foot. It is very perishable but is used for making sandals and for building houses.

The tree is a native of Malaya, Burma and Ceylon. Although it appears to have no special merit, it has been planted in several Calcutta streets and gardens, and specimens may be seen near the south-west corner of the Curzon Gardens, and in the garden of Belvedere.

The flowers appear in the hot season. The leaves are changed in March.

**MORINDA.** (From the Latin "morus", a mulberry, and "indus", Indian, because the fruit resembles a mulberry.) A genus of about 40 species of trees, shrubs, and climbers, natives of the tropics. The flowers are clustered on spherical heads, the calyces being more or less joined together into a compact mass. The white leathery petals number from 4 to 7, and are partially joined to form a tube, on the inside of which the stamens are placed. The fruit consists of a fleshy mass composed of the numerous succulent calyces, which are more or less completely joined together, each containing a single seed.

About 7 species of this genus are found in India. There has been some difference of opinion about their classification, some authorities considering certain plants to be only varieties, while others think them to be distinct species.

In addition to the species described below, *M. tinctoria* Roxb., is cultivated in many parts of India for the dye obtained from its roots, and may possibly be found near Calcutta. It is a shrub differing from *M. citrifolia* in having hairless petals, and purplish fruits.

**Morinda citrifolia** Linn. *var.* bracteata. *Syn.* M. bracteata *Roxb.*

(Citrifolia means "with leaves like the lemon tree". Bracteata means "provided with bracts", i.e. modified leaves at the base of the flower-stalk).

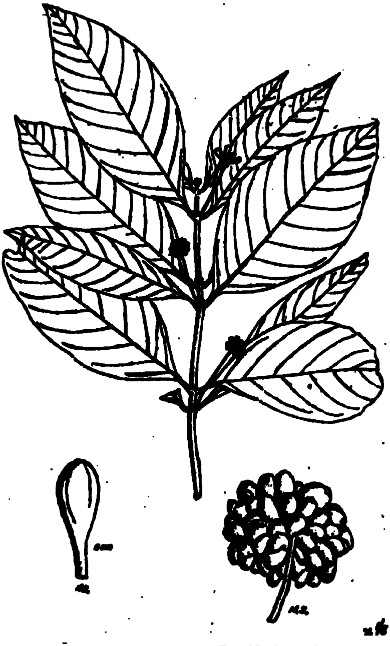
| | |
|---|---|
| Bengali | *haldi kunch, ronch, hardi, barachand, ban ach* |
| Hindi, | *al, ach, ak.* |
| English, | *Indian mulberry.* |

(With the exception of of *ban ach*, the above vernacular names are more usually applied to other varieties and species).

(F.I. p. 183. F.B.I. Vol. III. p. 156. B.P. Vol. I. p. 573.)

A large glabrous shrub or small tree ; leaves opposite, broadly elliptic, acuminate, acute or obtuse, shining, 5 to 8 inches long ; petiole ½ inch long ; stipules large, broadly oblong or semi-lunate, connate ; peduncles ½ to 1½ inches long, often leaf-opposed, usually solitary ; flowers 5-merous, in dense ovoid or globose heads ; calyx truncate, but often with one large foliaceous lobe ; corolla white, infundibuliform, about 1/3 inch long, (much larger in *var. elliptica*), the mouth hairy, lobes acute ; fruits of many drupes coalescent in a green, fleshy head 1 to 1½ inches diam.

This is a small tree or a large straggling shrub with smooth, pale bark. The rather large, narrow, pointed, shining leaves are set on short stalks, mostly in opposite pairs. Many small white flowers are collected in spherical or egg-shaped heads, the lower parts of the flowers being joined together. The white petals of each flower are separate from those of the other flowers, but are themselves partially united into a tube, on the inside of which the stamens are borne. From the green calyx of a few of the flowers a single leaf-like projection sometimes grows, much longer than the white petals. The fruit consists of a green, spherical or egg-shaped, fleshy mass, consisting of the combined fruits of all the flowers in the head, each of which contains a single seed. The surface of this composite fruit is usually covered with small knobs, each representing the fruit of a single flower, and bounded


MORINDA CITRIFOLIA

by five sides and five angles ; but sometimes the surface is more deeply broken up into a number of roundish lumps. The heads of flowers, and afterwards the fruits, grow on short stalks, which spring from the twigs, each opposite a solitary leaf or from the base of a pair of leaves.

This plant differs considerably from the typical *M. citrifolia,* and is sometimes considered to be a separate species. The typical plant is a shrub, which sometimes flowers as a woody herb, with equal calyx-teeth and whitish fruit. It is sometimes grown in Bengal for the dye obtained from its roots, and may perhaps be found near Calcutta.

It is not clear to what extent the red or yellow dye, known as *al* or *ach,* can be obtained from the roots of this wild tree as well as from the several species of shrubs that are cultivated to yield the dye. As, however, this tree is generally considered to be only a variety of *M. citrifolia,* it is probable that it will give much the same dye as the cultivated plant. The dye used to be widely used for colouring carpets, and yarns in general, but has now been largely superseded by synthetic substitutes.

The unripe fruit is sometimes eaten in curries, and the ripe fruits are eaten raw, especially in Burma. The roasted seeds are also eaten by the Burmese.

The wood is fairly hard and close-grained, weighing about 45 lb. per cubic foot. It is used for turning, and for making plates and dishes.

Medicinally the root is used as a cathartic and laxative, and the leaves are given as a tonic and febrifuge, and applied externally to relieve the pain of gout. The unripe fruits, charred and mixed with salt, are applied to spongy gums.

The tree is indigenous along the coasts of the Bay of Bengal, including the Sundarbans, and extends up the banks of the Hooghly as far as Calcutta, in the neighbourhood of which it is not uncommon. The flowers and fruits, appear at all seasons of the year.

A very distinct variety of this species with much larger flowers, known as *var. elliptica* Hook. f. is occasionally planted in villages near Calcutta. The leaves measure from six to eight inches in length and are narrowly elliptic in shape. The fragrant flowers are about 1¼ inches long and are very reminiscent of jasmine ; they show up well against the dark green of the leaves, and the tree is well worth a place in a large garden. This variety is indigenous in various parts of India and Malaya.

**GARDENIA.** (Named after Dr. Alexander Garden of South Carolina, a correspondent of Linnaeus). A genus of about 60 species of shrubs and small trees found in subtropical parts of the eastern hemisphere. The leaves are arranged in opposite pairs, or in whorls of 3, or sometimes in clusters. The leaf-buds are more or less resinous. The showy, white or whitish flowers are scattered among the leaves, and are usually fragrant. The corolla consists of a tube divided near its mouth into 5 or more lobes. The ovary has only one cell, and the fruit is a fleshy berry containing many rather large seeds.

In addition to the foreign species cultivated in India at least 5 species are indigenous in this country. Except *G. florida* Willd. (described below), and some foreign shrubs closely allied to it, no gardenias are commonly seen in the damper parts of central Bengal, but several species wild in neighbouring parts of India are sometimes planted in gardens, and may occasionally be met with in Calcutta. The following key will serve to distinguish them:—

A. Branches spinous; flowers not more than 1 inch across.
  b. Small tree; corolla lobes flat and spreading.
    *G. turgida* Roxb.
  b. Shrub; corolla bell-shaped.
    *G. campanulata* Roxb.

A. Branches not spinous; flowers at least 2 inches across.
  c. Flowers always "double"; fruit distinctly 5-ribbed.
    *G. florida* Willd.
  c. Flowers not "double", fruit not ribbed.
    d. Leaves not more than 3 inches long; flowers without stalks.
      G. *gummifera* Linn.
    d. Leaves mostly over 4 inches long; flowers stalked.
      e. Leaves shining distinctly stalked; nerves 20 to 30 pairs.
        *G. lucida* Roxb.
      e. Leaves not shining, not or scarcely stalked; nerves about 12 pairs.
        *G. latifolia* Ait.

*G. turgida* Roxb. (Hindi, *thanella, ghurga*), is a small, deciduous, spinous tree with smooth, bluish-grey bark, and fragrant white flowers with a corolla tube about ½ inch long. It is found in most of the dryer parts of India and ascends the hills to an altitude of about 4000 feet.

*G. campanulata* Roxb. has rather smaller, greenish-white flowers. It is indigenous in Sikkim, Assam, and Chittagong.

*G. gummifera* Linn. is a handsome shrub with whitish bark, and large white flowers with a slender tube. At certain seasons a clear drop of gum covers the leaf-buds and the whole plant is very resinous. The gum collected from this plant is known as *dikmali* or cambi resin, and is much used medicinally as an antiseptic, stimulant, carminative, and anthelmintic. The fruits are eaten. The shrub is common in many dry parts of India, including Chota Nagpur.

*G. lucida* Roxb. (Hindi, *dikmali*) is another handsome shrub or small tree, with rather darker bark than the last, and much longer leaves. The gum has the same properties as that of *G. gummifera*. This plant is found mostly in western and southern India, but also in Behar and Chittagong. It is commonly cultivated in gardens in the dryer parts of India, but very seldom in Bengal.

*G. latifolia* Ait. (Hindi, *papra*) is a small tree with a round low crown and grey bark peeling off in flakes. The solitary, heavily scented flowers are 3 or 4 inches across, with a tube up to 2½ inches long, and from 5 to 9 corolla-lobes. It is indigenous in Behar, the west of India, and the foothills of the Himalayas. It is perhaps rather more commonly planted in Bengal than the other indigenous species, and is considered the most handsome of them all. The wood is said to be made into combs, and the fruit is edible. The tree is deciduous from March to April, and the flowers chiefly appear on the leafless branches in April, the fruit ripening about 8 months later.

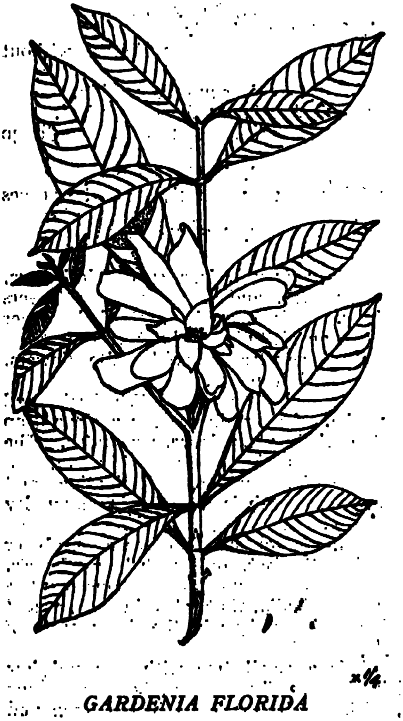
**Gardenia florida** Willd. *Syn.* G. jasminoides *Ellis.* G. radicans *Thunb.* (Florida is Latin meaning "flowering richly". Jasminoides means "resembling jasmine". Radicans is Latin meaning "rooting".)

| | |
|---|---|
| Bengali, | *gandharaj.* |
| Hindi, | *gundharaj.* |
| English, | *Cape jasmine, gardenia.* |

(F.I. p. 236. F.B.I. Vol. III. p. 115. B.P. Vol. I. p. 565.)

A large evergreen shrub; shoots and buds resinous; leaves opposite or 3-whorled, obovate or oblanceolate, acuminate, subacute, strongly nerved, subglabrous, shining and dark green, 4 to 6 inches long; petioles very short; flowers solitary near the ends of the branchlets on peduncles not more than ½ inch long; calyx about 1¼ inches long, green, 5- to 6-ridged with the ridges ending in long subulate sepals; corolla white, up to 3 inches diam.; tube stout, up to 1 inch long; lobes always "double" in India, outer lobes oblanceolate, up to 1½ inches long; berry ellipsoid, strongly ribbed, orange when ripe.

This well-known gardenia is a dense evergreen shrub, or a small bushy tree, with fairly smooth, greyish bark and shining, dark green foliage consisting of almost stalkless leaves crowded in opposite pairs, or in whorls of three, near the ends of the numerous twigs. Each rather narrow leaf is broadest above the centre, and pointed at the tip, and tapers gradually to the very short stalk. There is a strong central nerve and up to twenty pairs of prominent secondary nerves, which spread outwards from the central nerve to the smooth margin of the leaf. The young leaves and shoots have a varnished look owing to a resinous substance which exudes from them. The large, highly scented creamy-white flowers are borne singly on short stalks near the ends of the branchlets



*GARDENIA FLORIDA*

among the leaves. In the case of the cultivated forms of this plant (which are the only forms known in India), the flowers are always "double", that is to say the lobes of the corolla are numerous and occur in several whorls, in the centre of which the stamens are found, often mingled with several small petal-like processes. The lower part of the corolla consists of a stout, fleshy, greenish tube, which is contained within a green calyx with five or six prominent ridges terminating in long needle-like teeth. The fruit is a fleshy berry with strong ribs, which turns orange when ripe ; but the plants in Bengal seldom, if ever, produce ripe fruits. Within the fruit are many seeds surrounded by orange-coloured pulp.

This is one of the commonest shrubs in Bengal gardens, and is very popular owing to the beauty, and delicate but strong scent, of its large, camellia-like flowers. When they first open the blooms are almost pure white, but they soon turn slightly creamy in colour, and eventually yellowish or brownish before they fall. The plants are usually large, dense shrubs but they sometimes grow up to twenty feet in height and take the form of small, rather straggling trees, usually branching from near the base and with a dense bushy crown. The flowers appear from time to time at all seasons of the year except the cold weather.

Hindus make much use of the flowers in worship but they do not offer them to Vishnu because the scent is considered too heavy.

Sir George Watt records that in the Konkan the root is rubbed into a paste with water and applied to the top of the head as a remedy for headache. It is also given internally in cases of hysteria. The Japanese are said to use the bark and the pulp of the fruit to yield a yellow dye, and Roxburgh records that the pulp is used for dyeing in some parts of India.

This plant is a native of China and Japan, but is widely cultivated in warm climates and also in temperate countries under glass. A number of varieties, or closely allied forms (some of which may be of hybrid origin), are found in Indian gardens, of which *G. Fortunei* and *G. Veitchii* are the best known. The former is a dwarf plant only a few feet in height, and the latter a larger shrub with fine fragrant flowers, compact and regular in outline. The flowers of the common tall variety are often rather irregular, and have their outer petals more or less crumpled or rolled, giving the blooms a star-like shape.

**IXORA.** (From the Sanskrit word "ikvara", the name of a Malabar idol to which the flowers of some species are offered.) A genus of about 100 species of shrubs and small trees, indigenous in the tropics of Asia, Africa, and America. The small white, yellow, or more usually red, flowers are borne in broad clusters at the ends of the branches. The calyx segments and petals normally number 4 each; the petals are partially joined, to form a slender tube, the free segments being twisted when in bud. A long style springs from the ovary, and projects beyond the petals, but is less than twice as long as the tube formed by the petals. The fruit contains two oblong seeds (or occasionally only one), and is usually partially divided into two divisions.

About 15 species of this genus are indigenous in India, and a very large number of species, varieties, and hybrids are cultivated in Indian gardens, among which are some of the most beautiful of all the shrubs to be found in the tropics. The great majority of these plants are shrubs with red flowers, but a few have white, yellow, or pink flowers. Only one species seems worthy to be called a tree. The most common of the shrubs are perhaps *I. undulata* Roxb. (Bengali, *palaka jui*) with white flowers and rather narrow pointed leaves on stalks over ¼ inch long, a native of Behar and the hills of north-east India; and *I. coccinea* (Bengali, *rangan*) with red flowers, a native of south-western India.

**Ixora parviflora** Vahl.

(Parviflora is Latin meaning "with small flowers".)

| | |
|---|---|
| Bengali, | *rangan, gandhalrangan* |
| Hindi, | *kota gandhal, makrichijhar, nevari, loha jangia.* |
| English, | *torch tree.* |

(F.I. p. 128. F.B.I. Vol. III. p. 142. B.P. Vol. I. p. 571.)

A small glabrous, evergreen tree, cymes sometimes pubescent; leaves coriaceous, shining, oblong or elliptic, obtuse, base usually rounded, sometimes cordate, entire, 3 to 5 inches long, subsessile; stipules small, broadly ovate; flowers white or rarely pink, scented, in terminal, compound, trichotomous cymes; corolla glabrous, about 1/3 inch long, lobes 4, linear-oblong, obtuse; style pubescent, filiform; fruit didymous, about ¼ inch diam.

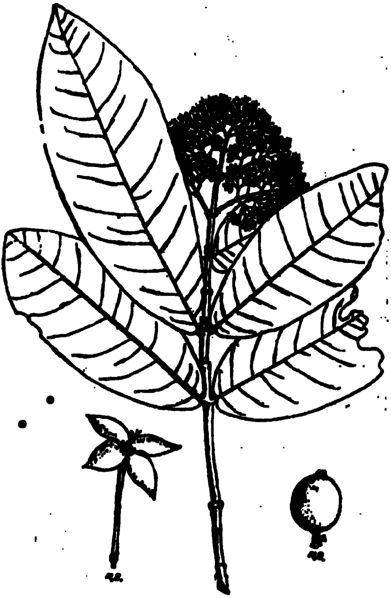
This is a large evergreen shrub or a small tree, with rough, dark brown bark, which peels off in irregular rounded scales, and dark green, shining, blunt and rather narrow leaves set in opposite pairs on extremely short stalks. Its very small, scented flowers grow in broad clusters at the ends of the branches; their usual colour is dull white, but trees with pinkish flowers are occasionally found. The four slender petals are joined for about two thirds of their length to form a narrow tube, beyond the mouth of which a forked style projects. The fruit is a shiny black berry about the size of a pea, somewhat two-lobed, and containing two seeds.

This little tree is indigenous and common in most of the dryer parts of India, and although it does not seem to be wild in the neighbourhood of Calcutta, it is often found in gardens and villages. Compared with the magnificent shrubs of this genus which are so frequently found in gardens, its rather dingy white flowers are far from attractive, but their scent is sweetly fragrant, and the tree has the advantage of handsome evergreen foliage and a quick growth. Like most of the other members of the genus it flourishes in fairly heavy shade, and for this reason is useful in shrubberies, and for forming a screen in situations where few other trees will grow.

The wood is very hard and close-grained, weighing about 60 lb. per cubic foot. It is used for furniture, building, turning, and sometimes for engraving.

The ripe fruits are eaten by the Santals, and the leaves are given as fodder to buffaloes. The green branches burn very freely and are used as torches ; they were formerly employed by runners carrying letters at night.

The flowers appear in March, April, and May.



*IXORA PARVIFLORA*

## MYRSINACEAE

This is a family of about 23 genera with about 550 species of shrubs and trees, natives of warm countries. The leaves are not divided into separate leaflets, and are seldom set in opposite pairs. The flowers are all bisexual, or male, female, and bisexual flowers may be found on the same tree. The calyx persists while the fruit ripens, and often becomes enlarged with the fruit. The petals usually number 5 and are generally joined near their base. The stamens equal the petals in number, are arranged opposite to the petals, and are frequently joined to them. The fruit usually consists of a berry containing one, or a few, seeds.

The family takes its name from the genus *Myrsine* which is represented by several species in India, but not in lower Bengal.

**ARDISIA.** (From the Greek "ardis", a point, in allusion to the projecting style). A genus of about 230 species with bisexual flowers borne in broad flat clusters (umbels or corymbs). The genus is distinguished by the petals being twisted in bud with the right-hand edge of each overlapping the left hand edge of the next petal, and by separate, hairless anthers. The fruit is a fleshy, spherical berry containing a single seed.

About 30 species are found in India, but only one near Calcutta. The fruits ripen from October to January.

**Ardisia solanacea** Roxb. *Syn.* A. humilis *Vahl.*

(Humilis is Latin meaning "of low growth". Solanacea means "resembling *Solanum*".)

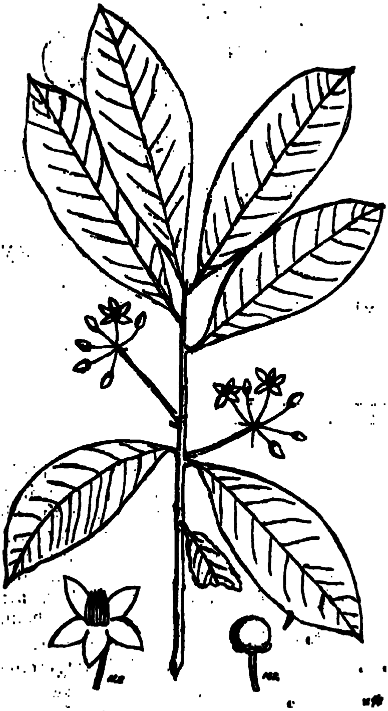
Bengali, *ban jam.*

(F.I. p. 195. F.B.I. Vol. III. p. 529. B.P. Vol. I. p. 645.)

A shrub or small tree; leaves glabrous, entire, obovate-oblong, obtuse or subacute, often twisted at apex, narrowed to a short petiole, 4 to 8 inches long; flowers in axillary or terminal corymbs; pedicels ¼ to ½ inch long; calyx segments slightly connate at base; corolla 2/3 inch diam., lobes 5, spreading, pink, waxy, subacute; berry 1/3 to 2/3 inch diam., scarlet or black, globose, 1-seeded.

This is a shrub or a small tree, sometimes branching from the base, with smooth, brownish bark and evergreen foliage. Its bright green, rather fleshy, shining leaves are set on short stalks scattered along the twigs. The waxy pink flowers grow in broad, flat clusters mostly borne among the leaves. Each flower has five stamens with protuberant yellow anthers, and five spreading petals, which are joined near their base to form a very short tube. The fruits consist of spherical, juicy, black or scarlet berries each containing a single seed. The juice of the berry is of a very beautiful bright red colour.

The wood is grey and fairly hard, weighing about 39 lb. per cubic foot. The plant is credited with stimulant and carminative qualities by Indian physicians.



*ARDISIA SOLANACEA*

This little tree is common throughout most of India, chiefly on the banks of streams. Near Calcutta it is often found in thickets and village shrubberies, especially south of the city. It often flowers when only a small bush and sometimes forms a dense undergrowth in clearings and waste places. A specimen may be seen in the Zoological Gardens (in 1941).

The flowers appear at most times of the year but especially during the hot weather.

**JACQUINEA.** (Named after N. J. de Jacquin, a collector and painter of West Indian plants, 1727-1817). A genus of about 6 species of shrubs and trees, natives of tropical America. The leaves are rigid and are sometimes arranged in opposite pairs, or in whorls. The 5 wide-spreading petals are joined at their base, and 5 appendages (staminodes) alternate with the petals. The stamens number 5 and are placed opposite the petals. The fruit is a leathery berry containing several seeds.

Several shrubs of this genus are occasionally grown in Indian gardens.

**Jacquinea ruscifolia** Jacq.

(Ruscifolia means "with leaves like *Ruscus*". *Ruscus aculeatus* Linn, the butcher's broom, is a small shrubby plant of the lily family, with prickly leaves, common in the south of England).

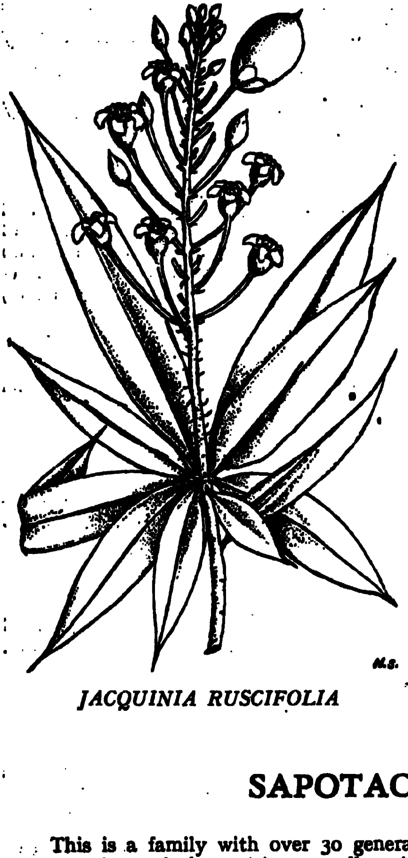
(Not in F.I., F.B.I. & B.P.)

A large evergreen shrub or small tree; leaves scattered, crowded near ends of branches, rigidly coriaceous, subsessile, elliptic, acuminate, ending in a sharp spine, about 1¾ inches long by ½ inch wide; flowers 1/3 inch diam., in short terminal racemes; calyx greenish, lobes closely imbricate; corolla orange, lobes 5, narrow, spreading, reflexed; staminodes petaloid, smaller than the corolla-lobes and alternating with them; stamens 5, exserted; ovary glabrous; stigma capitate; fruit ovoid, smooth, orange-red, about ½ inch long, ending in a sharp spine; seeds several, flat.

This is a low, bushy, evergreen tree or a large, round shrub, with a very short trunk and rough, brown bark. Its small, narrow, stiff and leathery leaves are densely crowded near the ends of the branches, and each ends in a needle-like point. The colour of the foliage is very dark, and its density throws a heavy shade into the interior of the rounded crown of the tree, so that the whole plant has a dark and sombre aspect. At the end of February and during the hot season many star-like, bright orange, flowers are borne in small clusters at the ends of the branches. Each flower has five stamens with whitish anthers projecting a short way beyond the broad tube formed by the petals, and appears to have ten narrow, spreading petals; but in fact the petals number five only and five barren stamens, resembling petals, alternate with the petals. The fruit consists of a smooth orange berry, terminating in a sharp spine similar to the prickles on the ends of the leaves, and containing several seeds set in juicy pulp.

The tree is a native of Mexico and the West Indies. It is occasionally grown in Indian gardens for ornament and to form hedges. Specimens may be seen (in 1943) in the Calcutta Zoological Gardens and in the garden at Belvedere.

The wood is close-grained and extremely hard. The plant is difficult to propagate vegetatively, but is easy to grow from seed.



*JACQUINIA RUSCIFOLIA*

## SAPOTACEAE

This is a family with over 30 genera and nearly 400 species, mostly trees, natives of the tropics, usually with milky juice. The leaves are leathery in texture, not set in opposite pairs, and always undivided, and with smooth edges (entire). The flowers are usually bisexual, and are generally borne in clusters among the leaves. The calyx has from 4 to 8 almost distinct segments, while the petals number from 4 to 24 and are joined near their base into a short tube. The stamens are inserted on the tube formed by the petals, and either equal the petals in number, or are 2 or 3 times as many. The ovary is free from the calyx, and the fruit is a berry containing from 1 to 8 shining seeds.

The young shoots and young leaves are usually covered with minute hairs which are attached in the middle, and therefore have two ends each. The stems often contain a milky juice.

The family takes its name from the Mexican word "zapote", the vernacular name for the tree now known as *Achras Zapota* Linn. (see below).

**ACHRAS.** (An ancient Greek word meaning a kind of wild pear). A genus containing a single species, distinguished by 6 calyx-segments (of which 3 are larger, forming an outer circle), 6 overlapping petals, 6 stamens opposite the petals alternating with 6 petal-like structures (staminodes), and a berry containing 4 to 12 seeds.

**Achras Zapota** Linn.

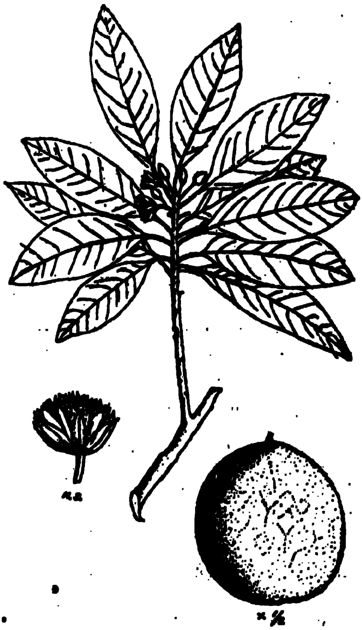
(Zapota is from the Mexican name of this tree.)

| | |
|---|---|
| Bengali, | *sapota.* |
| Hindi, | *sapota.* |
| English, | *sapodilla plum, sapota plum, American bully, Australian cranberry, mazeberry, neesberry, rough chaff, chiku.* |

(F.B.I. Vol. III. p. 534. B.P. Vol. I. p. 647. Not in F.I.)

A medium-sized evergreen tree; leaves crowded near ends of branches, coriaceous, shining, oblong-lanceolate or elliptic-oblong, obtuse or subacute, 3 to 6 inches long; petiole ½ to 1 inch; flowers solitary, axillary, long-pedicelled, whitish, about ½ inch diam.; sepals 6, the 3 outer larger and subclavate; corolla subglobose, lobes 6, imbricate, at least half as long as the tube; stamens 6, opposite the corolla-lobes, alternating with petaloid staminodes; ovary inferior, 10- to 12-celled; style clavate; berry globose or ovoid, epicarp rough, brown, thin, 1½ to 2 inches diam; seeds 5 or more, black, shining.

The sapota is a handsome tree with rough, dark grey bark, and a dense crown of narrow, shining, leathery leaves set on stalks of moderate length and crowded near the ends of the branches. The rather small, dull-white flowers grow singly on somewhat long stalks among the leaves. Each flower has its principal parts arranged in whorls of six; there are six sepals (of which three are larger than the others), six petals, six petal-like barren stamens (known as "staminodes") inside the petals and alternating with them, and six fertile stamens opposite the petals. The fruit consists of an almost spherical or egg-shaped berry with a thin, rough, russet-brown rind, containing five or more slender, shining, black seeds embedded in pink or brownish, soft, translucent pulp.



ACHRAS ZAPOTA

This tree is a native of tropical America, but is now much cultivated in India for its excellent fruit, which if plucked at exactly the right time and eaten while quite fresh, have a delicious, if rather cloying, flavour, reminiscent of a medlar. It is essential, however, that the fruit should be fully ripe when eaten, otherwise its taste is astringent, and, if overripe, the flavour is soon spoilt. The fruits, when ready for picking, shed a powder from their skins, and their flesh turns to a brownish or deep greenish hue. In South America a delicious sherbet is said to be made from them.

The wood is reddish-brown, hard, and very durable. Medicinally the bark is used as an astringent, a tonic, and a febrifuge, while the seeds are aperient. The fruits, soaked in butter all night and eaten in the morning, are considered a preventive of biliousness and fevers. The milky juice is known as "chicle", and forms the basis of chewing-gum. In India it is used as a cement for joining small articles.

The flowers appear mostly in May and June, but also at the end of the rains. The fruits ripen chiefly in August and September, but also at other times. The tree is propagated easily by seeds, grafts, layers, or gooties, but the best trees are obtained from seeds. Grafts will bear fruits within four years. Many of these trees are grown in gardens and villages in the neighbourhood of Calcutta. The new leaves appear in February and March.

In America a number of striking varieties are known, some of which produce almost seedless fruits, and others fruits weighing more than a pound each. The best kind in Bengal is said to be a variety know as *baro mashia,* i.e. "all the year round".

**MIMUSOPS.** (From the Greek "mimo", an ape, and "opsis", appearance, in allusion to a fancied resemblance in the flower to the face of an ape). A genus of about 30 species of evergreen trees with milky juice, natives of the tropics, of which 3 species are found in India. The calyx-segments number 6 or 8 in 2 series, and the petals 18 to 24 in 2 or 3 series. The 6 to 8 fertile stamens alternate with the same number of barren stamens (staminodes). The hairy ovary contains 6 to 8 chambers (cells), and the fruit is a fleshy berry containing 1 or more seeds.

**Mimusops Elengi** Linn.

(Elengi is a vernacular name of Malabar.)

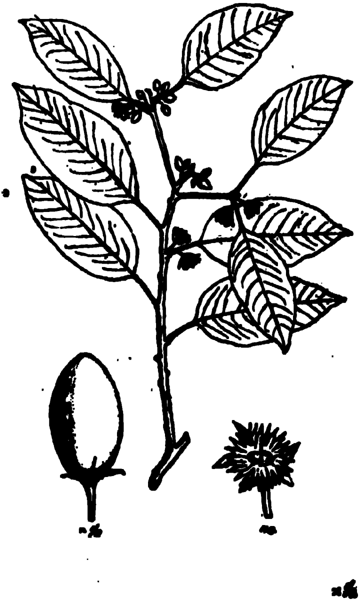
| | |
|---|---|
| Bengali, | *bakul, bohl, bukal.* |
| Hindi, | *mulsari, maulser, bolsari, bakul.* |
| English, | *Indian medlar.* |

(F.I. p. 318. F.B.I. Vol. III. p. 548. B.P. Vol. I. p. 649)

A middle-sized or large, evergreen tree; young shoots, pedicels, and outside of calyx rusty-pubescent; leaves scattered, glabrous when mature, shining, elliptic, shortly-acuminate, undulate, 3 to 4 inches long; petiole ¾ inch or longer; flowers greenish-white, scented, nearly 1 inch diam., solitary or in fascicles; calyx-segments 8 in 2 series, lanceolate, acute; corolla lobes about 24, linear-oblong, acute; stamens 8; staminodes 8, lanceolate, acuminate, hairy on the back; ovary silky-pubescent; berry ovoid, yellow when ripe, about 1 inch long; seed 1.

The bakul is a handsome evergreen tree with a straight trunk generally about ten feet high to the lowest branches, rather rough, dark grey bark, and very numerous spreading branches, the ends of which tend to rise and form a thick globular head to the tree. The shining, rather narrow, pointed leaves are closely scattered along the branches on somewhat short stalks. The dull-white, scented flowers grow in small clusters, or solitarily, among the leaves, each flower having a large number of sepals, petals, and stamens, which spread stiffly outwards in the form of a flat star. The fruit is a smooth shining berry which turns orange when ripe, and contains a single seed in juicy pulp.

This tree is cultivated chiefly for its ornamental foliage and for its fragrant flowers, which are much used for making garlands, and sometimes for stuffing pillows; they retain their scent long after they are dry, and a perfume can be distilled from them. Hindus sometimes collect the fallen flowers from the ground beneath the trees and use them for religious purposes. The fruits are eaten by poor people, and are occasionally made into a preserve.



*MIMUSOPS ELENGI*

The bark is sometimes collected for tanning and to dye fabrics various shades of brown. An oil is obtained from the seeds which is said to be used by painters, as well as for cooking and burning. The wood is very hard, and close- and even-grained, and weighs 50 to 60 lb. per cubic foot; it is useful for house-building, carts, furniture-making, and boat-building.

The tree is much valued by Indian physicians. The unripe fruit and seeds are chewed for the purpose of fixing loose teeth. The bark is prescribed for biliousness and diseases of the gums, and the flowers for disease of the blood. Various parts of the tree are made into lotions for the treatment of wounds, and to cure dysentery. A snuff made from the dried and powdered flowers is given to relieve feverish colds. The leaf is supposed to be a remedy for coma resulting from snake-bite, and an infusion of the leaves is used as a cold compress for headache.

The bakul is said always to have hermaphrodite flowers, which appear from March to July, and to bear fruit during the hot season and rains. But two trees that were planted some years ago outside the main gate of the Royal Agri-Horticultural Society's gardens at Alipore have behaved in a curious way. The young trees were taken at random from among a number of others, and appeared exactly similar, but after a time differences in the foliage and in the manner of growth began to appear, one tree being apparently more robust than the other. At the time of writing (in 1942), the trees are about 20 feet high, and both bear flowers at various times of the year, particularly in the cold season, when bakul trees do not usually flower at all. Moreover the more robust tree, although it produces large numbers of apparently perfect bisexual flowers, has never borne a fruit, while the less robust tree produces fruit in profusion, but at seasons quite different from those during which bakul fruits usually appear. The behaviour of these two trees seems to call for investigation, since it appears that they are showing a tendency to behave as if each tree was unisexual in the manner of dioecious plants, i.e. those which have their male and female flowers on separate trees.

The bakul is a native of the Western Peninsula of India, the Northern Circars, the Andamans, and Burma. It is now commonly planted all over the plains of India, and is often grown in Calcutta, both in gardens and as an avenue tree in the streets of the city. It grows well in shady places where other trees cannot flourish. The new leaves mostly appear in February, when the trees often appear a bright vivid green.

A handsome variety of this tree with variegated leaves is sometimes grown in gardens.

**MADHUKA.** (A Sanskrit name). A genus of about 30 species of trees with milky juice, natives of India, Malaya, and Polynesia, of which 4 species are found in India. The calyx-segments number 4 or 5, and the 6 to 12 petals are partially joined to form a bell-shaped tube. The stamens are all fertile and are at least twice as many as the petals. The fruit is a berry containing 1 to 4 seeds.

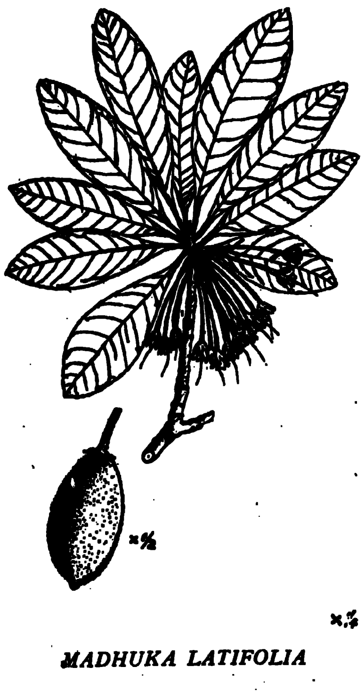
**Madhuka latifolia** (Roxb.) Macbride. *Syn.* Bassia latifolia *Roxb.*
(Latifolia is Latin meaning "with broad leaves".)

| | |
|---|---|
| Bengali, | *mahula, banmahuva, mahwa, maul.* |
| Hindi, | *mohwa, mahua, janglimoha, mahula, maul.* |
| Urdu, | *mahuva.* |
| English, | *butter tree, mohwa.* |

(F.I. p. 411. F.B.I. Vol. III p. 544. B.P. Vol. I. p. 648.)

A large deciduous tree; leaves clustered near ends of branches, broadly elliptic or elliptic-oblong, rigidly coriaceous, shortly acuminate, 5 to 8 inches long; petiole 1 to 1½ inches; flowers in dense fascicles near the ends of the branchlets; calyx coriaceous, segments 4 or 5, densely tomentose outside; corolla cream-coloured, fleshy, caducous, 2/3 inch long; lobes usually 8 or 9, short, erect; stamens 24 to 26, anthers subsessile; berry ovoid, greenish, fleshy, ½ to 1 inch long; seeds 1 to 4.

The mohwa is a tree of fair size having a short, but straight, trunk covered with fairly smooth, ash-coloured bark that peels off in thin scales, and numerous branches usually forming a rounded crown. The broad, firm, leathery leaves are clustered on stalks of considerable length near the ends of the twigs and are narrowed at both ends, terminating in a short point at the tip. Many rather small, whitish flowers grow in large numbers near the ends of the twigs, each on a separate stalk springing from the main stem, and with eight or nine fleshy petals partially joined to form a cup-shaped tube. They have a peculiar scent, sweet but musty, which is very unpleasant to most people on first acquaintance, but exceedingly attractive to many animals, and to men who have learnt to appreciate the flowers as food. The petals



*MADHUKA LATIFOLIA*

soon fall, and carpet the ground beneath the trees with a layer of scented blooms. The fruit is a greenish, egg-shaped berry containing one or several seeds set in a fleshy covering.

This is a very important tree in most of the dryer parts of India owing to its valuable timber and fruits, but particularly on account of its fragrant, fleshy petals, which are eaten both raw and cooked, are made into sweetmeats, and are the principal source of country spirit in many districts. To collect the flowers a clear space is swept under the tree, and the petals are gathered as they fall. Properly prepared they are said to be pleasant to eat, tasting rather like pressed figs. Deer, bears, and other animals are very fond of them and may be shot under the trees when the petals are falling.

The fruit is also valuable, the outer coat being eaten, raw or cooked, as a vegetable, and the inner layer being ground into meal. An oil, or butter-like grease, is obtained from the seeds, which is used for cooking and soap-making, and as an adulterant of ghee, and is exported for the manufacture of margarine. The oil-cake is a good manure, and is spread on lawns as a worm-killer. The smoke from the burning oil-cake is reported to kill insects.

The wood is very hard and weighs about 62 lb. per cubic foot. It is used for furniture, the naves of wheels, and similar purposes, but the trees are seldom cut for timber owing to the value of their flowers and fruits.

The tree has a large number of medicinal uses. The bark heals wounds, and is said to cure leprosy. The milky juice is astringent and is a remedy for rheumatism. The flowers are prescribed for the treatment of heart disease, coughs, biliousness, and ear troubles. The fruit is believed to cure diseases of the blood and consumption, while the honey from the flowers is used in the treatment of eye diseases.

The mohwa is indigenous in many of the dryer parts of India, and is grown in most places, propagating itself by self-sown seed, but in the south of India it is largely replaced by a similar species, *M. longifolia* Linn., which has much narrower leaves. It is not established in the wetter parts of Bengal, but is occasionally planted there.

The leaves fall during the cold season and appear again in March and April with the flowers. At that time, in places where the tree is common, the forests are heavily scented with the musty odour of the blooms. The fruits ripen in June or July.

# EBENACEAE

A family of 5 genera with about 300 species of trees and shrubs, natives of the tropics. The leaves have smooth (entire) edges, and are not arranged in opposite pairs. The flowers are usually unisexual, the male and female flowers being found on separate plants (dioecious). The petals are partially joined to form a tube, at the base of which are inserted (in the case of male flowers) stamens 2 to 16 times more numerous than the petals. The ovary is free from the calyx, terminates in from 2 to 8 styles, and contains as many chambers (cells) as there are styles, or twice as many. The fruit is usually a berry containing several seeds.

The family takes its name from the Greek word "ebenos", ebony.

**DIOSPYROS.** (From the Greek "dios", divine, and "puros", wheat). A genus of about 200 species of trees, natives of the tropics, of which about 35 species are found in India. The flowers are usually unisexual, the male and female flowers being generally found on separate trees (dioecious), but occasionally male, female, and bisexual flowers may be found together on the same tree (polygamous). The sepals and petals usually number 4 to 5 each, and the stamens number from 8 to 64, often being arranged in pairs or otherwise joined together. The female flowers contain barren stamens (staminodes). The fruit is a berry with a leathery rind containing several seeds embedded in soft or viscid pulp.

The genus includes a number of valuable timber trees including *D. Ebenum* Koenig., the ebony, a native of South India and Ceylon, which yields the well-known jet-black wood. Several other species also yield black or very dark timber.

The genus also includes *D. Kaki* Linn., the persimmon, a native of Burma, China, Japan, and of the Khasi Hills, which is occasionally grown in Indian gardens for its edible fruit. This is a small tree with softly downy leaves and flowers, and spherical red or yellow fruit 2 or 3 inches across. It has been grown in Calcutta but is not successful in the climate of lower Bengal, though it may perhaps be found occasionally in gardens and orchards.

**Diospyros cordifolia** Roxb. *Syn.* D. montana *Rox. var.* cordifolia.

(Cordifolia means "with heart-shaped leaves". Montana means "growing in the mountains".)

| | |
|---|---|
| Bengali, | *ban gab, moish kanda.* |
| Hindi, | *bistendu, dasaundu, lohari, tendu.* |
| English, | *mottled ebony.* |

(F.I. p. 415. F.B.I. Vol. III. p. 555. B.P. Vol. I. p. 653.)

A large shrub or small tree, usually unarmed; branchlets and undersides of leaves tomentose or pubescent; leaves ovate or oblong, base usually cordate, about 2½ inches long, chartaceous; petiole very short; flowers dioecious, white, usually 4-merous; corolla campanulate, lobes short, spreading; male flowers 1/5 inch diam., campanulate with short spreading lobes, in small cymes, anthers 16 in 8 pairs; female flowers solitary, drooping, on short pedicels, white, ¼ inch diam., staminodes usually 8, ovary glabrous; fruit 1 to 1½ inches diam., globose, glabrous, yellow when ripe.

* * *

This tree has been regarded by some authorities as a variety of *D. montana* Roxb., which differs in having leaves that are hairless beneath with a rounded or tapering base, and much smaller fruits. *D. montana* is not found in lower Bengal.

* * *

This is a low spreading tree, or a large shrub, having dark, brownish bark, which flakes off in small pieces, and rather narrow, pointed leaves, with a papery texture and covered with fine down beneath. At the base of the leaf, where it is joined to its very short stalk, there is usually a recess, but in this respect the plant is variable. The small white flowers are each of one sex only, the male and female flowers being borne on separate trees (dioecious); the males grow in little clusters scattered along the branches, but the female trees bear solitary flowers, much larger than the male flowers, on short drooping stalks. The fruit is smooth and spherical, and yellow when ripe, and contains about eight seeds. There are sometimes a number of branched thorns on the twigs.

*DIOSPYROS CORDIFOLIA*

The wood is reddish or yellowish-white and fairly hard, and weighs about 46 lb. per cubic foot. The fruit is supposed to be poisonous, but is used by bhistis to cure the boils which often appear on their hands. In Chota Nagpur the leaves of this tree, or of its near relative *D. montana*, are crushed and used to poison fish.

This tree is indigenous in Burma, Malaya, Australia, and most of the hotter and dryer parts of India. It is reported by Sir David Prain to occur in village shrubberies in the vicinity of Calcutta, but it is certainly not common in lower Bengal.

The flowers appear during the hot season, and the fruits take nearly a year to ripen.

All parts of the tree have a bitter taste, and the fruit has a very unpleasant smell.

**Diospyros peregrina** Gürke: *Syn*. D. embryopteris *Pers*. Embryopteris glutinifera *Roxb*.

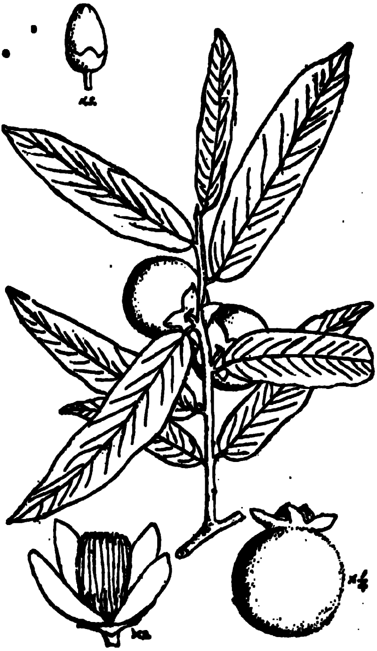
(Peregrina is Latin meaning "strange", or "foreign". Embryopteris is

Greek meaning "with winged embryo". Glutinifera is Latin meaning "bearing gum".)

| | |
|---|---|
| Bengali, | *gab, makur-kendi, kala tendu.* |
| Hindi, | *gab, kala tendu, tendu, makur-kendi.* |
| Urdu, | *tindu.* |
| English, | *river ebony.* |

(F.I. p. 413. F.B.I. Vol. III. p. 556. B.P. Vol. I. p. 653.)

An evergreen tree; buds silky; leaves oblong, obtuse or subacute, distichous, coriaceous, glabrous, shining, 5 to 8 inches long; petiole up to ½ inch long; flowers dioecious, usually 4-merous, scented; calyx hairy, green; corolla glabrous, whitish; male flowers about 1/3 inch long, in small axillary cymes, stamens about 40 in pairs on the corolla tube; female flowers larger, about 1 inch wide by ½ inch long, 1-5 together, short-pedicelled, staminodes up to 12, hairy, styles 4; fruit subglobose, 1½ to 2 inches diam., when ripe yellow covered with easily detachable brown scurf; pulp glutinous; seeds 4 to 8.



*DIOSPYROS PEREGRINA*

This is an evergreen tree of moderate size having a short, straight trunk often much fluted and ribbed, smooth, almost black bark, and a dense rounded crown of dark green, shining foliage, with low spreading branches which sometimes almost reach the ground. Its long, narrow, leathery leaves are arranged on short stalks in two opposite rows on either side of the branchlets. The small, scented, whitish flowers grow at the bases of the leaf-stalks, the flowers being of one sex only and the two sexes being found on separate trees. The male flowers are smaller than the female and grow in little clusters, while the female flowers are borne singly or a few together, on very short stalks. Both sexes have four petals partially joined to form a short tube. The fruit is a spherical berry with a leathery rind containing several seeds embedded in viscid and glutinous pulp. When ripe the fruit is yellow, but covered with a brown scurfy coating, which is easily rubbed off.

The new leaves appear in March and April when they assume a handsome red colour, making the trees very beautiful and conspicuous for a short time; but the leaves soon change to their usual deep shining green. The flowers appear in April and May, and the fruits ripen at the end of the monsoon; they are often borne in great profusion, and a good tree is said to produce as many as 4000 fruits in one crop.

The fruit is edible, but is exceedingly sour until quite ripe, when it suddenly becomes sweet and mawkish; it is much liked by monkeys, and is sometimes eaten by humans, but it is said to burn the throat and to cause great thirst. It is principally in demand for caulking boats, for which purpose the viscid pulp is extensively used throughout Bengal and Assam. The pulp also yields a glue which is employed by carpenters and for book binding. It is full of tannin and is sometimes used for tanning skins. It is also much valued for making an infusion in which fishing nets are steeped to make them durable and is occasionally employed to dye cloth a brownish colour.

The timber is grey with dark streaks, fairly hard, and close-grained. It weighs about 45 lb. per cubic foot. It is not much valued, but is sometimes employed for building purposes and for making the masts and yards of boats.

Medicinally the juice of the unripe fruit is used to treat ulcers and wounds, in the cure of dysentery, and as a gargle for sore throats. The ripe fruit is believed to cure biliousness and diseases of the blood. The bark is considered a remedy for intermittent fevers and the flowers for hiccough and lumbago, and an oil extracted from the seeds is used to treat diarrhoea.

The tree is indigenous throughout most parts of India, Malaya, and Australia. In dry districts it usually grows on the banks of streams and rivers. It is fairly common in villages near Calcutta, and is sometimes grown in gardens for its ornamental leaves and fruit, but is nowhere plentiful. A specimen may be seen (in 1942) near the junction of Mayo Road with the Red Road, and another on the Ballygunge Maidan near Store Road.

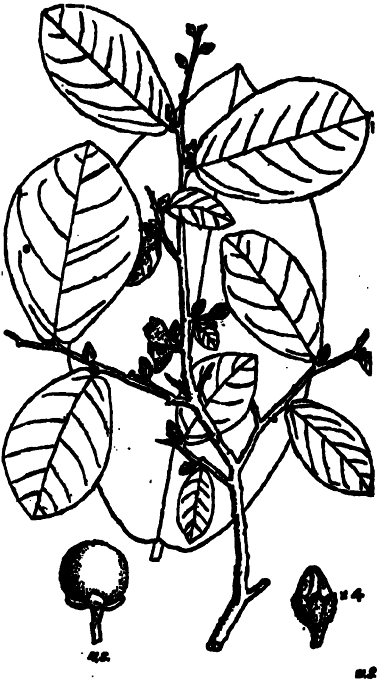
**Diospyros Chloroxylon Roxb.**

(Chloroxylon is the generic name of the satin-wood tree, a member of the family *Rutaceae*. The word is from the Greek "chloros", green, and "xulon", wood.)

(F.I. p. 415. F.B.I. Vol. I. p. 560. B.P. Vol. I. p. 653.)

A medium-sized, dioecious tree; branchlets pubescent, slightly thorny; leaves alternate, elliptic or obovate-oblong, acute, pubescent on both surfaces, bright green above, pale beneath, up to 2 inches long; petiole 1/5 inch long; male flowers subsessile in axillary panicles; calyx 4-partite, pubescent; corolla 4-lobed, white, urceolate, 1/8 inch diam.; stamens 16 in 2 ranks; female flowers solitary, sessile, slightly larger than male; staminodes 7 to 9; ovary glabrous, styles 4; fruit 1/3 inch diam., glabrous, globose, 2- to 3-seeded.

This is a small spreading tree with very rough, dark-greyish bark, and slightly prickly branches. Its rather small pointed leaves are minutely hairy on both surfaces, and are bright green above, but pale beneath; they are set on very short stalks along the slender downy branchlets. The small white flowers are of one sex only (though the female flower contains barren stamens or "staminodes"), and the two sexes are borne on separate trees. The male trees bear dense clusters, each of a few flowers, set on the twigs at the bases of the leaves, each flower having four minute white petals containing about sixteen stamens in two whorls of eight. The female flowers are solitary and grow without stalks; they are rather larger than the males and contain a smooth ovary with four styles surrounded by barren stamens. The smooth and almost spherical fruit is about as big as a large pea, and contains two or three seeds.



*DIOSPYROS CHLOROXYLON*

The ripe fruits are sometimes eaten, and are said to be very palatable.

The timber is hard, durable, and yellow in colour. It is reported to be useful for many purposes.

The tree is a native of west and south India and parts of Orissa. A single specimen grows near the north-west corner of the Eden Gardens.

The flowers appear at the beginning of the rains, and the fruits ripen in the following hot season. The leaves are renewed in April and May.

**Diospyros discolor** Willd.

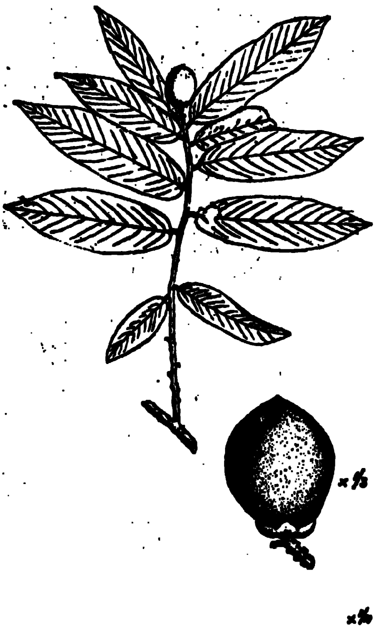
(Discolor is Latin meaning "of different colours".)

| | |
|---|---|
| Hindi, | *bilayati gab.* |
| English, | *mabola, velvet apple, butter fruit, peach bloom.* |

(F.B.I. Vol. III. p. 569. B.P. Vol. I. p. 654. Not in F.I.)

An evergreen tree; leaves alternate, oblong, acute, base rounded, shining above, silky beneath, up to 8 inches long by 2 inches wide; petiole ¼ inch; flowers dioecious, whitish, about ½ inch diam; calyx deeply 4-lobed; corolla tubular, villous; male flowers in cymes near ends of branches, stamens 22 to 24, glabrous; female flowers solitary, staminodes 4 or 5, styles 4; fruit ellipsoid, hairy, brownish when ripe, up to 2½ inches long; seeds 4 to 8.

This is an evergreen tree of moderate size, with a straight trunk, fairly smooth, greyish bark, and rather short branches. Its long, narrow, pointed leaves are set on short stalks, and are dark green and shining above, but covered with minute silvery hairs below. The small whitish flowers are of one sex only, the male and female flowers being found on separate trees, the males in small clusters near the ends of the branches, and the females separately, each on a short stalk; their petals are partially joined to form a downy tube. The fruit is egg-shaped or almost spherical and contains several seeds embedded in whitish, strongly scented, rather dry pulp; its rind is thin and velvety, brown or reddish in colour when ripe, with a "bloom" like a peach.



DIOSPYROS DISCOLOR

The fruit is supposed to be edible, but although the ripe pulp has a delicious scent, its taste is exceedingly cloying, and the fruit seems to be seldom eaten in India. The tree is useful for shade, and is grown in gardens for its ornamental foliage and for the fine show of fruits provided by the female trees. It is of course necessary to grow a male tree near the female trees in order to produce fruits.

The tree is a native of Malaya and the Philippines, but is now widely cultivated in tropical countries. It is not uncommon in gardens near Calcutta, and specimens may be seen (in 1941) in Barrackpore Park, the garden at Belvedere, and the Royal Agri-Horticultural Gardens at Alipore. It is also occasionally found in village shrubberies.

The flowers appear in March and April and the fruits ripen in July or August.

## OLEACEAE

A family comprising about 21 genera with about 400 species of trees, shrubs and climbers, natives of tropical and warm countries. The leaves are nearly always in opposite pairs, and are sometimes divided into separate leaflets arranged in two rows on either side of a central midrib (pinnate). The flowers are usually hermaphrodite, and always symmetrical. The calyx is small, and the petals, which often number 4, are generally partially combined to form a tube, but are occasionally separate or altogether wanting. The stamens number 2 only, and the ovary contains 2 chambers (cells). The fruit is variable in form, but contains from 1 to 4 seeds only.

The *Oleaceae* take their name from the genus *Olea*, which includes *O. europaea* Linn., the olive tree. The family also comprises *Fraxinus* (which includes *F. excelsior* Linn., the common ash, a well-known tree in Britain) and *Syringa* (including *S. vulgaris* Linn., the common lilac, a beautiful shrub often grown in temperate countries). In Indian gardens the family is represented by a number of shrubs and climbers of the genus *Jasminum*, of which the best known are *J. sambac* Ait., (Bengali, *bel*), the Arabian jasmine, and *J. pubescens* Willd. (Bengali, *kunda*), a climbing shrub often cultivated in Bengal and found, as if wild, in thickets near Calcutta.

**NYCTANTHES.** (From the Greek "nux", night, and "anthos", a flower). A genus containing 1 or 2 species only, distinguished from other genera by leaves not divided into separate leaflets, and by a flat, dry fruit which separates when ripe into 2 flat divisions each containing one seed.

**Nyctanthes Arbor-tristis** Linn.

(Arbor-tristis is Latin meaning "sad tree".)

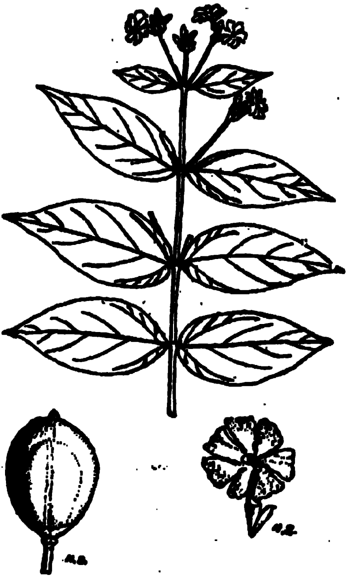
| | |
|---|---|
| Bengali, | *singhar, sephalika, harsinghar.* |
| Hindi, | *har, siharu, saihari, harsinghar, kuri, binari, seoli, nibari.* |
| Urdu, | *gulejafari, harsingar.* |
| English, | *tree of sadness, coral jasmine, night-flowering jasmine, Indian mourner, sorrowful tree.* |

(F.I. p. 29. F.B.I. Vol. III. p. 603. B.P. Vol. I. p. 660.)

A large shrub or small tree, roughly hairy all over; young branches quadrangular; leaves opposite, ovate, acute or acuminate, entire or with

**a few large distant teeth, up to 4 inches long ; flowers sessile, in pedunculate fascicles ; calyx campanulate ; corolla-lobes 5 to 8, white ; corolla tube orange, about ½ inch long, equalling the lobes ; anthers sessile in the corolla-tube ; capsule chartaceous, flat, obcordate or suborbicular, about ¾ inch long, separating into 2 flat 1-seeded carpels.**

This is a large, straggling, deciduous shrub or small tree, with thick, rough, pale brownish bark and numerous branches. Its young twigs have four pronounced angles, and the whole plant is rough and covered with stiff white hairs. The pointed leaves grow on short stalks in opposite pairs, their edges often smooth, but sometimes with a few coarse teeth or angular lobes. At night the scented flowers are borne in small dense clusters at the ends of short stalks ; their petals are partially joined to form a tube, which is bright orange in colour, but the upper parts of the petals that are not joined together are pure white. The fruit is a flat, roundish, papery pod, which splits into two parts, each containing a single seed.



*NYCTANTHES ARBOR-TRISTIS*

This is an unattractive plant when not in flower, but it deserves an unobtrusive place in a garden on account of the profusion of small orange and white, honey-scented blooms, which it bears from September to December. The flowers open towards the evening, and the petals fall off in the morning, often carpeting the ground beneath. The fruits ripen at the end of the cold season and the leaves are changed in the hot weather.

The orange tubes of the flowers are used to make a beautiful buff or orange dye for silk and other fabrics, but unfortunately no means has been found of making the colour permanent. This dye is valued in Burma for colouring the robes of Buddhist priests. The white parts of the petals are occasionally made to yield a purple dye, and a red colour can be obtained from the inner bark.

The wood is fairly hard and close-grained, weighing about 55 lb. per cubic foot. It makes an excellent fuel and is chiefly cut for this purpose. The bark is said to be used for tanning, and the rough leaves are sometimes employed for polishing wood. The root is said to be edible.

The leaves are used medicinally to cure fevers, rheumatism, and sciatica. The flowers are made into a hair tonic, and the seeds are a remedy for skin diseases, especially of the scalp. The oil from the bark is given for pain in the eye, and the bark is considered useful as an expectorant.

Hindus use the scented flowers in worship and as votive offerings, and, contrary to the usual rule, the flowers in the case of this tree may be gathered for these purposes after they have fallen to the ground. The poet Tagore is one of the many who have mentioned this tree in verse.

The tree is a native of northern, central, and nortn-eastern India, and is cultivated in most parts of the country. In some places it is an important forest tree because it is easily propagated, and yields valuable fuel. Near Calcutta it is fairly common in gardens and near villages. The trees are propagated from seed and should be renewed after about three years' life.

## APOCYNACEAE

A family of about 130 genera with over 1000 species, mostly tropical trees and shrubs, often with milky juice. The leaves are usually in whorls or in opposite pairs, and have smooth edges (entire). The flowers are bisexual, and symmetrical, usually with 5 sepals, 5 petals, and 5 stamens. The petals are partially joined to form a tube, the throat of which is often hairy or closed by a ring of scales. The ovary is usually divided into 2 divisions (carpels). The fruit consists of a berry, or more often two pod-like divisions opening along one suture only (follicles). The seeds often have tufts of hairs to assist distribution by the wind.

This family includes a large number of handsome shrubs and climbers common in Indian gardens. *Nerium odorum* Solander, the oleander (Bengali, *karabi*), is a poisonous but beautiful shrub with many slender stems branching from the base, narrow leaves in whorls of 3, and broad clusters of pink or white flowers, often "double". *Beaumontia grandiflora* Wall. is a huge climber with white flowers up to 4 inches long, a native of north-eastern India, and often grown on trees and trellises in Calcutta. *Carissa Carandas* Linn. (Bengali, *karamcha*) is an evergreen thorny shrub with white or pinkish flowers, cultivated in most parts of India for its edible black berries. *Carissa spinarum* A.DC. is a similar shrub found wild in thickets near Calcutta. The genus *Allamanda* contains several species of climbing shrubs, mostly with large yellow flowers, very common in Calcutta gardens, of which the best known is A. *cathartica* Linn. (Bengali, *har-kakra*). *Voacanga grandifolia* Rolfe is a tall shrub with large, narrow, pointed leaves clustered near the ends of the branches in opposite pairs, and large creamy-white flowers in drooping clusters at the ends of the branches, the general appearance being not unlike that of *Plumeria* (see below). *Kopsia fruticosa* A.DC. (*Syn. Cerbera fruticosa* Roxb.) is a bushy evergreen shrub with pretty pink flowers, which appear almost all the year round. *Cerbera Odollam* Gaertn. (Bengali, *dakur*) is a large shrub or small tree resembling a *Plumeria* in habit but with funnel-shaped, white and red flowers, and short, egg-shaped divisions of the fruit ; it is a native of salt swamps on the coasts of India and is occasionally planted in gardens : a large specimen was growing in the grounds of Hastings House, Alipore, in 1944. *Vallaris Heynei* Spreng. (Bengali, *hapar mali*) is a large climbing shrub with fragrant white flowers, common in gardens and in villages near Calcutta.

The family takes its name from *Apocynum* (the dogbanes), a genus of North American shrubs, not represented in India. In English the *Apocynaceae* are sometimes referred to as "the periwinkle family" because they include the genus *Vinca* represented in English gardens by two herbs known as periwinkles. The same genus includes *Vinca rosea* Linn. (Bengali, *gul feringhi*), a herb very common in Indian gardens, especially in sandy places, with pink or white flowers.

**THEVETIA.** (Named after André Thevet, a French monk, 1502-1590). A genus of 8 species of shrubs, natives of tropical America, of which one species is now widely distributed in the tropics. The leaves are narrow and not arranged in whorls or opposite pairs. The petals are large and showy, with their unjoined parts overlapping each other to the left. The anthers are included within the petals, and have rounded bases. The fruit consists of 2 almost completely united divisions (carpels), each containing 1 or 2 seeds.

**Thevetia peruviana** (Pers.) Merr. *Syn.* T. neriifolia *Juss.*

(Peruviana means "of Peru". Neriifolia means "with leaves like *Nerium*", i.e., the oleander).

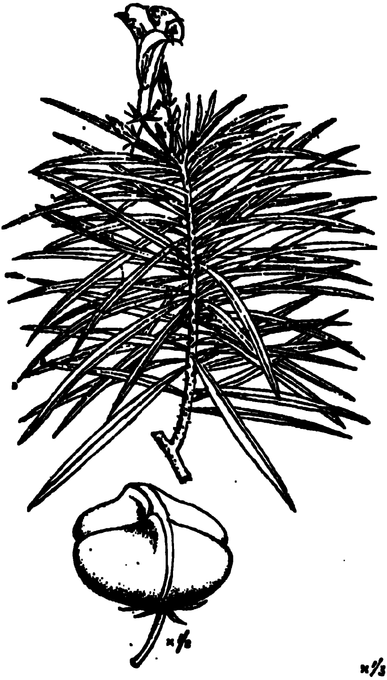
| | |
|---|---|
| Bengali, | *chinakarab, kokilphul, kolkaphul, haldi korubi.* |
| Hindi, | *kaner, pila, pilakanir, zardkunel, kulki phul.* |
| English, | *yellow oleander, bastard oleander, exile oil tree, trumpet flower, lucky bean.* |

(B.P. Vol. II. p. 669. Not in F.I. and F.B.I.)

A large glabrous, evergreen shrub or small tree with milky juice ; leaves spirally arranged, crowded, linear, acute at both ends, shining, 4 to 6 inches long, subsessile ; flowers in few-flowered terminal cymes ; calyx about ¼ inch long, segments 5, narrow ; corolla over 2 inches long, yellow, white or pinkish, infundibuliform, lobes 5, overlapping to the left ; stamens 5, inserted in the corolla throat, anthers incumbent on the stigma ; ovary superior, of 2 united carpels ; fruit broadly obtriangular in vertical section, elliptic in horizontal section, 1 to 1½ inches broad, fleshy, blackish when ripe ; seeds 2 to 4 in a thin endocarp.

This is a large evergreen shrub, or a small tree, with poisonous milky juice, thin, greyish-brown, shining bark, and slender spreading branches. Its very narrow, glossy leaves grow practically without stalks, closely crowded in spirals near the ends of the twigs. The large flowers are borne in small clusters among the leaves, the petals being joined for a great part of their length to form a funnel-shaped tube, which includes the stamens and ovary. Usually the colour of the flowers is bright yellow, but varieties with white, lemon-yellow, and pinkish flowers are sometimes grown. The fruit is a smooth fleshy berry, green when young, blackish when ripe, and curiously shaped. It usually contains four seeds which are set in a hard covering.

This very common plant is a native of the West Indies, but is now grown in gardens throughout the plains of India for its elegant shady foliage and handsome scented flowers, which are produced almost throughout the year. It is frequently planted in Calcutta, and seems to have run wild in many places. It can be very easily propagated by seed and is sometimes used as a hedge plant.



*THEVETIA PERUVIANA*

The seeds yield a bright yellow oil which burns well without much smoke. The wood is fairly hard but seems to be little used.

The milky juice is highly poisonous, and the seeds are also poisonous, for they contain a principle the action of which resembles that of digitalis, having an effect on the heart. The oil from the seeds can be given as an emetic and purgative, and the bark is a powerful febrifuge, but all parts of this plant have to be used with great caution. The seeds are employed to poison wild animals.

**PLUMERIA.** (Named after Charles Plumier, a French botanist, 1646-1706). A genus of about 45 species of trees with very thick branches and milky juice, natives of the warmer parts of America. The leaves are narrow and spirally arranged near the ends of the branches. The large flowers grow in clusters at the tips of the branches. The calyx is small and has 5 short lobes, while the 5 petals are joined near their base into a tube, and spread widely above. The 5 stamens are contained in the tube formed by the petals. The fruit consists of 2 narrow pod-like divisions (follicles), joined at the base, each of which opens by a single suture.

The numerous species of this genus have been much confused, and now that a large number of varieties and hybrids are cultivated in many parts of the world, their separation into botanical species is a matter of some difficulty. Most of the cultivated plants seem to be forms of *P. rubra* forma *acutifolia* (see below), but in addition the following species or varieties may be distinguished in Indian gardens:—

*P. rubra* Linn. *proper*. This is a smaller tree than most varieties of forma *acutifolia* with leaves not exceeding 9 inches in length. The flowers grow in crowded clusters on downy red stalks, the petals being broadly oval, and red in colour with a yellow centre. The scent is sweet; but less overpowering than that of forma *acutifolia*. This is the tree which is correctly known as "frangipani", and is also called "red jasmine."

*P. alba* Linn. This is also a smaller tree than most varieties of *P. rubra* forma *acutifolia*. Its leaves are usually rounded at the apex, and downy beneath, and curl inwards at the margins. The flowers are almost pure white and very fragrant, with rounded petals. The tree usually remains in leaf throughout the year.

*P. tuberculata* Lodd. has glossy, dark green leaves with blunt tips. The branches and trunk are covered with small, knobby, corky excrescences. The large flowers are white with yellow throats and are very sweet-scented.

*P. bicolor* Ruiz. & Pav. is a tall form with oblong, long-pointed leaves curled inwards at the margins, and white flowers with yellow throats.

**Plumeria rubra** Linn. forma acutifolia (*Poir.*) *Woodson*. *Syn*. P. acutifolia *Poir*. P. acuminata *Aiton*.

(Rubra is Latin meaning "red". Acuminata means "long pointed" in allusion to the shape of the leaves. Acutifolia means "with pointed leaves".)

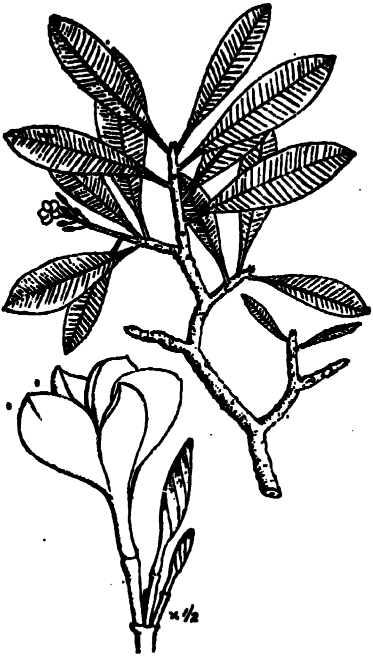
| | |
|---|---|
| Bengali, | *dalana phul, gorur champa.* |
| Hindi, | *chameli, gobur champ, golainchi, gulachin.* |
| English, | *pagoda tree, jasmine tree, frangipani.* |

(The latter name is more correctly applied to *P. rubra* proper, which has red flowers (see above). The word is said to have been derived from an Italian nobleman of that name, who in the middle ages made a perfume similar to the scent of this tree).

(F.I. p. 248. F.B.I. Vol. III. p. 641. B.P. Vol. II. p. 670.)

A small glabrous tree with thick branches and milky juice; leaves spirally arranged at the ends of the branches, oblong, lanceolate, or oblanceolate, acute at both ends, up to 15 inches long; petiole up to 2 inches; flowers in terminal cymes, scented, up to 2 inches diam.; calyx small, 5-fid; corolla salver-shaped, throat naked, lobes ovate; stamens included; ovary half inferior; follicles 2, pendulous rigid, about 5 inches long.

This is a small, fleshy, deciduous tree with thick, grey, shining bark, and stout, stiff, soft branches with blunt ends, full of milky juice. The long, narrow, pointed leaves grow densely crowded in spirals near the ends of the branches. Sometimes the young trees remain in leaf throughout the year, but older trees shed their leaves at the beginning of the cold season and often remain bare for many months, when the grotesque outlines of their stiff and swollen branches give the trees an ugly and uncouth appearance. The beautiful and highly scented flowers grow in stiff clusters from the tips of the branches. In the typical variety the waxy petals are white with a clear yellow eye, and a tinge of pink on their outer sides, but many types are in cultivation with different combinations of white, yellow, pink, and red in the petals. The habit of the trees also varies greatly, some varieties reaching thirty feet in height or more, while others only attain about twelve feet and have correspondingly smaller leaves. The fruit is not very often seen in Bengal, but consists of two long, cylindrical, pendulous pods (follicles) containing winged seeds ; the two follicles are joined together at the base.



*PLUMERIA RUBRA*

This tree, together with a number of allied species and varieties (see above), is very common in Indian gardens and is often planted near temples. The flowers appear from February to October, and at the beginning of their flowering period frequently open on the bare branches before the leaves. They are perhaps the most highly scented of all flowers, and distil a perfume which is sometimes almost overpowering, especially at night. The fruits are usually found in October or November. Hindus make much use of the flowers in worship.

The wood is whitish and soft, weighing about 37 lb. per cubic foot. It is used for making drums.

Medicinally the tree has a number of uses. The root-bark is a strong purgative, the leaves are made into a poultice to dispel swellings, and the milky juice is a remedy for rheumatism. The flower-buds are eaten with betel leaves in ague, and the bark is used in the treatment of diarrhoea, and as a febrifuge. The milky juice mixed with cocoanut oil is considered a cure for skin troubles.

The tree is probably a native of Mexico, but it has been cultivated in India from time immemorial. Propagation is easily effected by cuttings.

**ERVATAMIA.** (Etymology obscure). A genus of about 40 species of small trees and shrubs, natives of tropical Asia and Africa, formerly included in the genus *Tabernaemontana,* by which name they are still commonly known. The leaves are arranged in opposite pairs. The calyx is small, and the 5 petals are partially joined to form a slender tube, which includes the stamens, the free parts of the petals spreading widely above the tube and overlapping one another when in bud. The style is long and slender, and the fruit consists of 2 curved, leathery divisions (follicles), which open along one side to release several or many seeds, which are embedded in orange-coloured pulp.

A number of shrubs of the genus are cultivated in Indian gardens, of which the most remarkable is perhaps *E. dichotoma* Roxb., which has stiff, narrow leaves up to 8 inches long, and large, fragrant pure white flowers. It is known as Eve's apple, or the forbidden fruit, owing to the resemblance of its fruit to a small half-eaten apple, on which some people even claim that they can see the marks of Eve's teeth.

**Ervatamia divaricata** (L.) *Burkill.* *Syn.* E. coronaria *Stapf.* Tabernaemontana coronaria *Willd.*

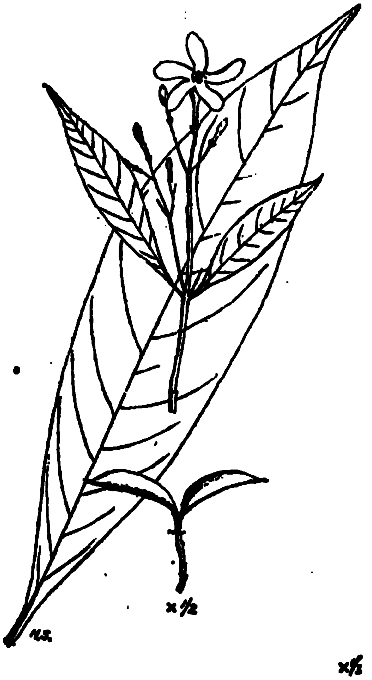
(Divaricata is Latin meaning "spreading widely", Coronaria means "crown-like", or "wreath-like".)

| | |
|---|---|
| Bengali, | *tagar, tugur, chameli.* |
| Hindi, | *chandni, chandui, taggai, taggar, sugandabala, firki-tagar* (single flowers), *bara-tagar* (double flowers). |
| English, | *wax-flower, Nero's crown, East Indian rosebay.* |

(F.I. p. 249. F.B.I. Vol. III. p. 646. B.P. Vol. II. p. 673.)

A glabrous, evergreen, dichotomously branched shrub, or small tree, with milky juice; leaves opposite, membranous, elliptic or elliptic-lanceolate, acuminate, glossy-green above, paler beneath, margins undulate, 4 to 6 inches long; petiole about 1/3 inch; flowers 1 to 2 inches across, in small cymes at the bifurcations of the branches, pure white, often with yellow centre; calyx 5-cleft, 1/6 inch long; corolla salver-shaped, tube slender, lobes 5, oblique, imbricated; stamens included, anthers 2-lobed at the base; follicles 2, ribbed, recurved, 1 to 2 inches long, red inside; seeds 3 to 6.

This is shrub, which flowers when only a year or two old and a few feet high, but sometimes lives to considerable age, and grows into a small bushy tree with a gnarled trunk covered with greyish bark. Its small, narrow, pointed, shining leaves grow in opposite pairs on short stalks. The rather large white flowers are borne in small clusters at the points where the branches fork. Their petals are jointed below to form a slender tube, which includes the stamens, but spread widely above. In the case of the common forms with "single" flowers, the spreading parts of the petals are slender, pointed, and gracefully curved, forming a shape reminiscent of a Catherine wheel; but "double" flowers having numerous crowded petals occur in cultivation. The fruit consists of two distinct, ribbed and curved pods (follicles), which ultimately open along one side to release several seeds, which are contained in red or orange pulp.



*ERVATAMIA DIVARICATA*

The graceful pure white flowers though inodorous by day are sometimes scented at night, and are borne in great profusion at most times of the year, but especially during the monsoon. In addition to the beautiful "double" variety, which has flowers very like those of *Gardenia florida*, a number of other varieties are grown, but only the common wild plant seems to attain a size which could possibly entitle it to be called a tree. The "single" flowers often have a small yellow eye at the mouth of the tube formed by the petals. The fruits ripen during the cold weather.

The wood is white, fairly hard, and close-grained, weighing about 47 lb. per cubic foot. It is tough, but too small to be of much value as timber.

The red pulp which surrounds the seeds is sometimes collected to dye fabrics a red colour. The wood is said to be burnt as incense, and to be used by perfumers. Hindus use the flowers in worship but do not offer them to Surya, the Sun-god.

Medicinally the root is prescribed for biliousness, diseases of the blood, epilepsy, paralysis, and scorpion-stings, and its charcoal is considered a remedy for ophthalmia. The wood is employed as a refrigerant, and the milky juice is rubbed into the head to cure pain in the eyes. The root is chewed to relieve toothache.

The plant is indigenous in the foot-hills of the Himalayas, and is abundant below Darjeeling. It is cultivated all over India, and its various varieties are often found in Calcutta gardens. The common variety shows signs of becoming established in thickets and open spaces in the neighbourhood of the city.

**HOLARRHENA.** (From the Greek "holos", the whole, and "arrhen", male). A genus of about 10 species of trees and shrubs, natives of tropical Asia and Africa, of which one only is found in India. The leaves are membranous in texture, and arranged in opposite pairs. The 5 petals are partially joined to form a slender tube, above which they spread widely, overlapping each other to the left. The stamens are situated within the tube formed by the petals and near its bottom, their anthers being rounded at the base. The fruit consists of 2 slender curved divisions (follicles) which open by one suture to release the numerous seeds, each of which has a tuft of hairs.

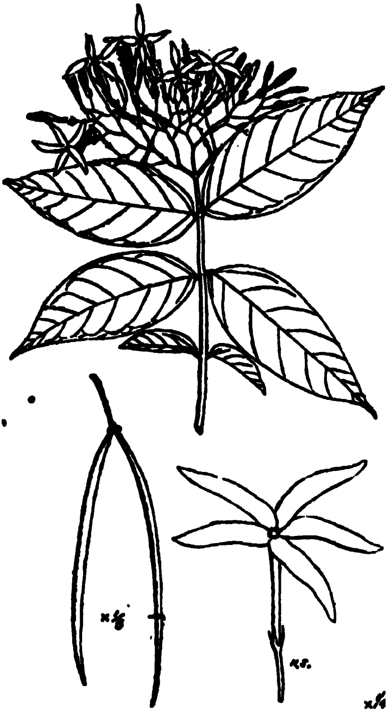
**Holarrhena antidysenterica** Wall.

(Antidysenterica means "curing dysentery".)

| | |
|---|---|
| Bengali, | *kurchi, tita-indarjau.* |
| Hindi, | *karra, kora, kuar, kari, karchi, dhudi, hat, kureya, karva-indarjau.* |
| English, | *Easter tree, conessi bark, ivory tree.* |

(F.B.I. Vol. III. p. 614. B.P. Vol. II. p. 674. Not in F.I.)

A small deciduous tree, glabrous or pubescent; leaves opposite, elliptic or ovate-oblong, obtuse or obtusely acuminate, membranous, subsessile, 6 to 12 inches long; flowers white, 1 to 1½ inches across, on slender pedicels in terminal corymbose cymes; calyx-lobes acute, ciliate, ⅛ inch long; corolla tube 1/3 inch long; lobes about equalling the tube, oblong, rounded at the apex; follicles cylindric, divaricate, up to 15 inches long, about ¼ inch diam.; seeds linear-oblong, ½ inch long, with a long brown coma.



HOLARRHENA ANTIDYSENTERICA

This is a tall shrub or a low tree, with rather rough, pale brownish bark, and large, somewhat narrow leaves set practically without stalks in opposite pairs along the smaller branches. Its white, scented flowers grow in loose flat clusters at the ends of the twigs. The five petals are joined for about half their length to form a narrow tube, which includes the stamens, but above the tube they spread out almost flat, showing their rounded tips. The fruits (which are not often seen in lower Bengal) consist of long, slender cylindrical pods, which open along one side to release a number of narrow seeds each tipped with a tuft of brown hairs.

The leaves of this tree fall at the end of the cold season and in March, or early in April (at about Easter time) the otherwise bare branches burst into a profusion of white flowers, which undoubtedly make this one of the most beautiful of all Indian trees. The fresh leaves follow soon after the first flowers, so that leaves and flowers may be seen together till about July ; a second flush of flowers is often produced from September to November.

The tree is indigenous throughout the plains of India except in the dampest districts. It is not wild in lower Bengal but is often planted for its lovely display of flowers and is very common in Calcutta gardens. Several varieties are grown, which flower at rather different times, and differ in the shapes of the leaves and flowers, and in the amount of down present on the leaves and stems. A tree with remarkably small flowers was growing in 1943 in the south-east corner of Dalhousie Square. The plants grow slowly and do not usually flower until they are three or four years old.

This is one of the most important of all Indian medicinal plants on account of its highly bitter and astringent bark, seeds, and leaves, which are extensively used, especially the bark, throughout India for curing dysentery, as well as for the treatment of many other diseases. The bark is a valuable specific for amoebic infections of the intestines, and was formerly well-known in Europe as well as in India. It seems, however, to have fallen at one time into disrepute owing to confusion between this plant and various species of *Wrightia* (see below), which have much less active medicinal properties. This mistake apparently originated in an error made by the great Linnaeus, which was not finally corrected till about the middle of the 19th century, but this tree is now the principal remedy for dysentery in the Hindu Pharmacopoeia. The bark is also used to cure diseases of the skin, and of the spleen. The flowers are considered a remedy for diseases of the blood, and the leaves are given for chronic bronchitis, lumbago, boils, and ulcers. The seeds are prescribed for asthma, colic, and fevers. Almost every part of the plant is supposed to be a remedy for snake-bite and scorpion-sting.

The wood is white, soft, and even-grained, weighing about 40 lb. per cubic foot. It is largely used for carvings, toys, spoons, forks, plates, furniture, and turning. In Assam beads are made of the wood and worn round the neck as a medicine. The wood-ash is collected in Chota Nagpur for dyeing. The floss from the seeds is sometimes used for stuffing pillows. The leaves are cut for cattle-fodder, and the flowers are popular as ornaments at weddings.

Hindus use the flowers in worship but do not offer them to Vishnu.

**ALSTONIA.** (Named after C. Alston, a Scottish botanist, 1685-1760). A genus of about 30 species of trees and shrubs, natives of the Indo-Malayan region, of which about 4 species are found in India. The leaves are usually arranged in whorls of 3 or more. The petals are partially joined to form a slender tube, the free part of the petals being shorter than the tube, and overlapping each other. The fruit consists of 2 distinct and very slender pod-like divisions (follicles) which open by one suture to release the flat, hairy seeds.

**Alstonia scholaris** R. Br.

(Scholaris is Latin meaning "belonging to schools", in allusion to the fact that the wood used to be made into blackboards).

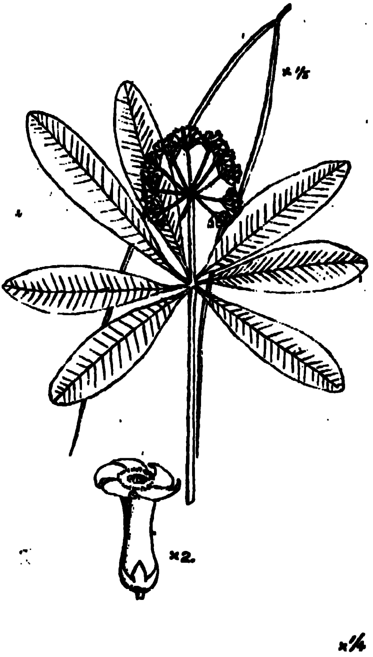
| | |
|---|---|
| Bengali, | *chhattin, chatwan, chatiun.* |
| Hindi, | *satni,' chatiun, saitan-ka-jhad, satwin.* |
| English, | *devil's tree, dita bark tree.* |

(F.B.I. Vol.. III. p. 642. B.P. Vol. II. p. 672. Not in F.I.)

**A tall evergreen tree with milky juice; leaves 3 to 7 in a whorl, glabrous, coriaceous, oblong-lanceolate or obovate, shining above, pale beneath, 4 to 8 inches long, narrowed into petiole about ⅓ inch long; flowers greenish-white, in many flowered, pedunculate cymes; peduncles whorled, 1 to 2 inches long; calyx pubescent, about ⅛ inch long; corolla tube about ¼ inch long; follicles slender, distinct, pendulous, up to 24 inches long; seeds ⅓ inch long, flattened, ciliate.**

This large evergreen tree has rather rough, dark grey bark, and branches usually arranged in whorls. Its smooth, shining, rather narrow leaves are dark green above, but milky-white below; they are set in whorls each of from four to seven leaves on very short stalks near the ends of the branches. Many small, greenish-white flowers are grouped in little clusters which are massed on long stalks at the tips of the twigs. The very slender, pendulous fruits hang in dense bunches and eventually split open to release numerous narrow, flat, hairy seeds. At night the flowers have a very strong, sweet and spicy scent.

The wood of this tree is white, soft, and not durable, but it is even-grained and easy to work; its weight is only about 28 lb. per cubic foot. It is used for making boxes, furniture, coffins, and blackboards.



*ALSTONIA SCHOLARIS*

The bark (known as *dita* bark) is astringent and bitter, and is valued for a wide variety of medicinal purposes, especially to cure fevers, heart diseases, asthma, ulcers, dysentery, and leprosy. The leaves are made into a poultice for application to ulcers.

In Bombay the tree is believed to be the abode of evil spirits, and it is said that once a year all the trees of the forest assemble to pay homage to it.

The tree is a native of China, Malaya, Ceylon, and many parts of the plains of India, where it occurs mostly in deciduous forests. It is not indigenous near Calcutta, but is sometimes planted in gardens and as an avenue tree. A specimen may be seen (in 1943) at the south-west corner of Dalhousie Square.

The flowers appear mostly from October to December. During the early months of the year the tree is conspicuous owing to the large clusters of thread-like, green fruits which hang from the ends of the branches.

**Alstonia macrophylla** Wall.

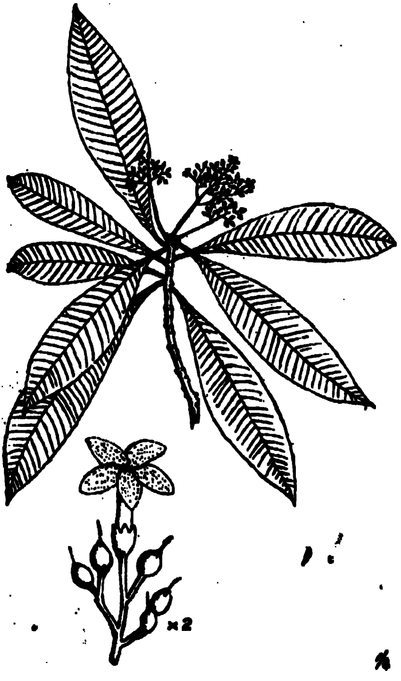
(Macrophylla is Greek, meaning "with large leaves".)

(F.B.I. Vol. III. p. 642. Not in F.I. & B.P.)

A tall tree; leaves mostly in whorls of 3, oblanceolate or elliptic-lanceolate, obtusely acuminate, pubescent or glabrous beneath, thinly coriaceous, shining above, rather paler beneath, up to 12 inches long; petiole about ½ inch long; flowers in axillary and terminal corymbose cymes, sessile or peduncled; corolla ½ inch long, glabrous, throat villous, white; follicles slender, pendulous, terete, up to 18 inches long.

This is a tall evergreen tree with smooth, grey bark, and short branches, which give it a graceful outline. Its large, narrow shining leaves grow on short stalks near the ends of the twigs, usually in whorls of three. The small white flowers are borne in loose clusters at the ends of the twigs and among the leaves, the petals partially joined to form a slender tube, which encloses the stamens. The fruit consists of two slender pendulous pod-like structures, which at first are bright green, but ultimately turn brown and split open along one side to release a number of slender seeds; they hang in large numbers from the ends of the branches.

This tree is a native of Malaya, but has been planted in various parts of India, and is occasionally



*ALSTONIA MACROPHYLLA*

to be found near Calcutta. Sir David Prain records that it occurs spontaneously in village shrubberies, and is one of the very few Malayan plants that show a tendency to become naturalised in lower Bengal. A specimen may be seen (in 1944) on the west side of St. George's Gate Road near Prinseps Ghat, and another in the garden of Belvedere.

The flowers appear from July to September. The fruits ripen from January to March, and are very conspicuous during the cold season.

**WRIGHTIA.** (Named after William Wright, a Scottish physician and botanist, 1740 to 1827). A genus of about 14 species of shrubs and small trees, natives of tropical Asia, Australia, and Africa. The leaves are arranged in opposite pairs. The small calyx has 5 segments. The petals are partially joined near their base to form a short tube, and spread widely above. At the throat of the tube formed by the petals there is a ring of scales (known as a "corona"). The stamens are exserted from the tube, the anthers conniving round, and adhering to, the stigma, with spurs at their base. The fruit consists of 2 slender divisions (follicles), which may or may not be joined to form a single fruit, and which open along one side to release the slender seeds, which bear a tuft of hairs at one end.

**Wrightia tinctoria** R. Br. *Syn.* Nerium tinctorum *Roxb.*

(Tinctoria is Latin meaning "used for dyeing".)

| | |
|---|---|
| Bengali, | *indarjau, indrajau.* |
| Hindi, | *dudhi, khirni, indarjau, mithaindarjau.* |

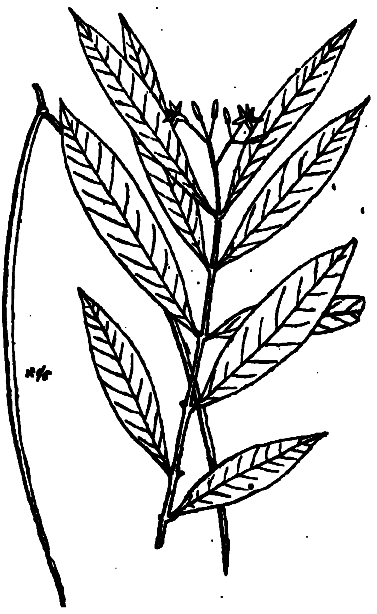
(F.I. p. 243. F.B.I. Vol. III. p. 653. Not in B.P.)

A deciduous tree, glabrous or pubescent; leaves opposite, elliptic-lanceolate, shortly acuminate, 3 to 6 inches long; petiole about 1/5 inch long; flowers white or pale yellow, up to 1 inch across, in lax terminal cymes; corolla tube ¼ inch long; corona scales numerous, linear, varying in length; anthers prominent; follicles 2, slender, 10 to 25 inches long, curved, glabrous, striate, usually cohering at the base only; seeds many, linear, 2/3 inch long, with a coma at the base.

This is a tree of very moderate size with an irregularly shaped trunk and rather rough, greyish bark. Its narrow, pointed leaves are arranged on very short stalks in opposite pairs scattered along the branches. The white or pale yellow, scented flowers grow in small lax clusters at the ends of the twigs. At the base the five narrow petals are joined to form a very short tube, above which they spread outwards widely. The stamens project beyond the mouth of the tube, and round the mouth there is a ring of slender scales. The fruit consists of two narrow, cylindrical, pendulous, pod-like divisions, which are usually joined only at their base, but sometimes at both ends. The seeds are very numerous and are crowned with down, like the seeds of a thistle.

The leaves of this tree fall during the cold season and are replaced in March and early April, at which time the flowers also appear and continue until June. The flowers are not borne in great profusion, and although the tree is sometimes planted for ornament, it cannot be considered one of the best of garden trees ; but the fragrant white flowers are much valued by Hindus as temple offerings.

The leaves used to be gathered for the manufacture of a blue dye similar to indigo, but the cost of preparation was found to be too high in comparison with real indigo. The seeds are also said to have been used for dyeing in conjunction with other materials. In Bombay the young leaves and pods are eaten as a vegetable.


*WRIGHTIA TINCTORIA*

The wood is white, even-grained and fairly hard, its weight being about 50 lb. per cubic foot. It resembles ivory, and is of excellent quality for carving and turning.

The bark and seeds are sometimes said to have much the same valuable medicinal qualities as those of *Holarrhena antidysenterica* (*kurchi*), but the general opinion is that they are almost inert. Unfortunately there has been much confusion between the two trees, and the bark and seeds of *W. tinctoria* have often been used to adulterate those of *H. antidysenterica* with disastrous results to the reputation of the latter tree as a source of medicine.

The tree is a native of Central and Western India and Burma. It is occasionally planted in Bengal gardens, and is not very uncommon near Calcutta. A number of trees are found in Alipore and elsewhere which seem to be hybrids between this species and *W. coccinea* (see below). These trees show almost every variation in size and colour of flower between the small white flowers of *W. tinctoria* and the large dark red flowers of *W. coccinea*. Several trees like the true *W. tinctoria*, but with larger flowers, may be seen near the car park at the Tollygunge Club.

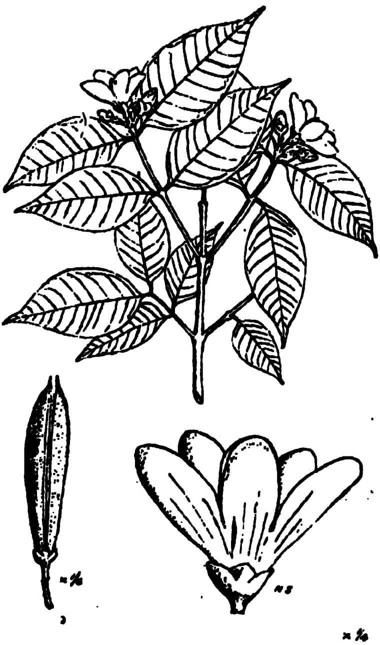
**Wrightia coccinea** Sims. *Syn.* Nerium coccineum *Roxb.*
(Coccinea is Latin meaning "red", or "scarlet".)

Bengali, *pallam*.

(F.I. p. 242. F.B.I. Vol. III. p. 654. B.P. Vol. II. p. 674.)

A deciduous tree, nearly glabrous; leaves opposite, elliptic, or elliptic-lanceolate, obtusely caudate-acuminate, base acute, 3 to 5 inches long; petiole very short; flowers subsessile, in few-flowered, terminal cymes, deep red, about 1½ inches across; sepals round, ⅛ inch diam., almost as long as the corolla tube; corolla thick, almost fleshy, lobes rounded; corona scales 5, ⅛ inch diam., rounded; anthers prominent; follicles 2, linear, about 10 inches long by ½ inch thick, verrucose with white tubercles.

In its native hills this tree is said to attain a large size, but in West Bengal it only reaches a very moderate height. Its trunk is straight but rather short, and the bark is smooth and ash-coloured. The somewhat narrow, pointed leaves are borne in opposite pairs scattered along the smaller branches. The rather large, deep red flowers grow in small clusters at the ends of the twigs; each has five broad, thick and almost fleshy petals, which are joined at their base to form a very short tube, and spread widely above. The stamens project beyond the mouth of the tube forming a pointed cone, and round the mouth are five rounded scales. The fruit consists of two slender, cylindrical, greenish, pendulous pods covered with small, raised, white points.



WRIGHTIA COCCINEA

This tree is a native of Sikkim, the hills to the east of Bengal, and Malaya. It is occasionally grown in Indian gardens for its handsome, red, velvety flowers, and perhaps because of the curious appearance presented in the cold season by its long pendulous fruit suspended among the branches. The tree is not very uncommon in Calcutta gardens, but most of the specimens to be found there seem to have some of the characteristics of *Wrightia tinctoria*, and it seems probable that they are hybrids between the two species. A wide range of size and colour between the large red flowers of *W. coccinea* and the small white flowers of *W. tinctoria* can be found in the neighbourhood of Alipore. Two trees not unlike the true *W. coccinea* may be seen (in 1942) in the Calcutta Zoological Gardens.

The flowers appear in March and April just after the new leaves. They have a bad smell and are probably pollinated by flies.

The wood is white and strong though remarkably light. It is used to make palkees, and for other purposes where lightness and strength are needed.

**Wrightia tomentosa** Roem. & Schult. *Syn.* Nerium tomentosum *Roxb.*
(Tomentosa is Latin meaning "densely covered with short hairs".)

| | |
|---|---|
| Bengali, | *dudh koraiya, dudhi.* |
| Hindi, | *daira, dharauli, dudhi.* |

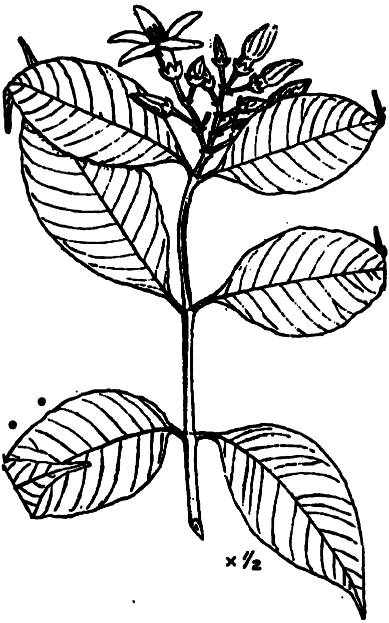
(F.I. p. 243. F.B.I. Vol. III. p. 653. B.P. Vol. II. p. 674.)

A small deciduous tree with yellowish juice; leaves opposite, distichous, elliptic, obtusely acuminate, tomentose beneath, with 8 to 14 pairs of prominent secondary nerves, 2 to 4 inches long; petiole about ¼ inch; flowers 1 inch diam., in terminal cymes; corolla lobes narrowly oblong, yellowish above, greenish below; corona orange, of 5 to 10 scales; follicles 6 to 12 inches long, 1½ inches diam., connate into a compressed, grooved, pendulous, greenish cylinder, verrucose with white tubercles.

This is a small tree with thick, grey, corky bark, and slender downy twigs. Its leaves are crowded in opposite pairs on short stalks in one plane on either side of the twigs; they have a long blunt tail at the apex, and about ten pairs of prominent nerves, which are very conspicuous on the downy lower surface. The flowers grow in small clusters at the ends of the twigs; each has five narrow, spreading petals, yellowish above and greenish beneath, which are joined near the base to form a tube. At the mouth of the tube is a ring of orange scales, which surround the five stamens and the style. The fruit consists of a single pod-like cylinder, which is greenish with white, raised spots, and has two grooves marking the junction of the two divisions (carpels). The slender seeds bear tufts of white hairs. The flowers have an unpleasant sweetish smell.

The wood is white, fairly hard, and even-grained, weighing about 40 lb. to the cubic foot. It is used for carving and turnery.

The bark of the stem and roots is (wrongly) considered an antidote for snake-bite. The Nepalese are said to use the yellowish juice to stop bleeding, and the Santals eat the leaves as a vegetable.



*WRIGHTIA TOMENTOSA*

This tree is found throughout India and Ceylon, usually in valleys and damp places. It does not seem to be indigenous near Calcutta but is occasionally planted in gardens and villages. A single specimen grows at the gate leading to the tennis courts of the Tollygunge Club.

The tree is leafless in February or March. The flowers appear from April to July, and the fruits ripen in the cold season.

## ASCLEPIADACEAE

A family of over 200 genera with about 1500 species, mostly climbers and natives of the tropics, generally with milky juice. The leaves are usually arranged in opposite pairs, and have smooth (entire) edges. The flowers are symmetrical and bisexual with their parts in fives. The calyx is usually divided to the base into 5 separate sepals. The 5 petals are joined near their base. The 5 stamens are attached to the petals near their base, and the anthers are joined together round the stigma. The pollen is in many genera united into waxy masses, attached to "pollen-carriers" which lie between the anthers. There are often appendages of various shapes attached to the backs of the anthers (staminal corona), or between the petals near their base (corolline corona). The style forms a composite structure with the stamens. The ovary consists of 2 divisions (carpels), and the fruit generally of 2 divisions (follicles) containing numerous seeds, which are usually winged and surmounted by a dense tuft of hairs.

The flowers of this family have curious and complicated mechanisms adapted to ensure cross-fertilisation of one flower by another through the agency of visiting insects. The mechanism varies in different genera, but always depends on the legs of a visiting insect becoming attached to a pollen-carrier, and taking away along with the pollen-carrier part of the pollen from each of 2 adjoining anthers, which pollen may subsequently become fixed to the stigma of the next flower visited by the insect.

The family includes a large number of climbers wild in Bengal and cultivated in Indian gardens. *Cryptostegia grandiflora* Br. is a climbing shrub, common in gardens, with small glossy leaves, and pale purple, funnel-shaped flowers. *Pergularia minor* Andr., the cowslip creeper, is another climber, with heart-shaped leaves, and fragrant greenish-yellow flowers growing in broad clusters not unlike those of a cowslip. A number of species of *Hoya*, with waxy flowers and very large appendages on the anthers, are cultivated in India, as also are several species of *Stephanotis* with long, tubular, scented, white flowers, and dark green, shining leaves.

The family takes its name from the genus *Asclepias*, of which one species *A. curassavica* Linn. is now established in many parts of India, and is sometimes grown in gardens, for its small flowers with scarlet petals and yellow stamens. The name is derived from that of Aesculapius, a famous Roman physician.

**CALOTROPIS.** (From the Greek "kalos", beautiful, and "tropis", the keel of a ship, in allusion to the shape of the fruit). A genus of 3 species of shrubs and small trees, natives of tropical Asia and Africa, all of which are found in India. The stamens are joined to form a tube round the style, and have large fleshy appendages on the backs of the anthers. The petals form a broadly bell-shaped structure when open, and do not overlap one another when in bud (valvate).

**Calotropis gigantea** R. Br. *Syn.* Asclepias gigantea *Roxb.*

(Gigantea is Latin meaning "gigantic", or "unusually high".)

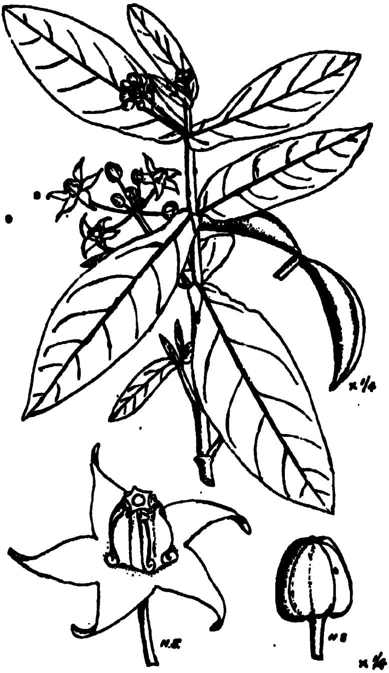
| | |
|---|---|
| Bengali, | *akanda, gurtakand, swet-akond* (the white flowered variety). |
| Hindi, | *madar, ak, ag, ark, akond, akan, safed-ak* (the white-flowered variety), *lal ak* or *lal madar* (the mauve-flowered variety). |
| Urdu, | *ak.* |
| English, | *swallow-wort, giant milkweed.* |

(F.I. p. 251. F.B.I. Vol. IV. p. 17. B.P. Vol. II. p. 688.)

A large shrub or small tree, more or less covered with cottony pubescence; leaves opposite, elliptic-oblong or obovate-oblong, acute, thick, glaucous, tomentose especially beneath, base cordate or amplexicaul, subsessile, 4 to 8 inches long; flowers in lateral cymes, purplish or white, up to 2 inches across; calyx divided to the base; corolla lobes deltoid-ovate. subacute; appendages of the corona pubescent, much longer than broad; follicles recurved, broad, thick, ventricose, green, up to 4 inches long; seeds numerous, ovate, flattened; coma up to 1½ inches long.

This straggling shrub or small gnarled tree is one of the commonest plants in Bengal. It has pale yellowish-white, or ash-coloured bark with deep vertical cracks. The young shoots and leaves, especially the lower sides of the latter, are covered with soft, white, woolly down. The large, pointed leaves are set practically without stalks in opposite pairs, their bases often partially encircling the stem from which they spring. The mauve or white flowers grow in small flat clusters along the branches. Five pointed petals spread outwards round a central column, which consists of the five stamens joined into a tube surrounding the style, to which they are firmly attached. A fleshy appendage, curiously shaped, is attached to the back of each stamen. The fruit consists of two separate, curved, fleshy, green divisions (known as "follicles"), which open down one side to release a number of flat seeds, each of which ends in a tuft of long, white, shining hairs.

This very well-known plant yields a large number of valuable products. Its abundant milky juice can be made into a kind of gutta-percha, which would be of great commercial importance were it not for the fact that it is a good conductor of electricity and therefore of no use for making electric cables. The juice is also employed in tanning, and yields a yellow dye that is used for colouring leather. The bark gives a fine strong fibre, which is made into bow-strings, and fishing-nets, and is useful for all purposes where durability under water is of importance. The floss from the seeds is much valued for stuffing pillows, having the reputation of being cool, soothing, and sleep-inducing. A thread can be spun from the floss, and is sometimes used for making yarn in combination with cotton. In some places a manna is said to be obtained from the plant, probably as the result of the activities of some parasitic insect. An intoxicating liquor is sometimes prepared from the milky juice. The twigs are used as tooth-brushes.



*CALOTROPIS GIGANTEA*

The wood is white and soft, and is little used except to make gunpowder charcoal.

Medicinally the plant has a very large number of uses. The roots, bark and juice are valued as emetics and purgatives, and to cure various skin-diseases. The flowers are considered a remedy for tumours, inflammations, diseases of the liver, rat-bites, and asthma. The leaves are laid on paralysed limbs, painful joints, and swellings. Oil in which the leaves have been boiled is applied to wounds. Various parts of the plant, especially the leaves, are popular remedies for rheumatism, and similar ailments. The latex is used for wounds and tooth troubles.

The leaves and stalks are valued in some parts of India for manuring fields, for which purpose they are believed to have some special merit. They are also used for reclaiming saline lands, their decomposition in some way sufficing to "kill the salt", as the cultivators say.

Hindus use the flowers in various ceremonies. Along with the white flowers of *Datura* they are employed in the worship of Shiva, and garlands made from them are specially prepared, on the fourth day of the waxing moon in the month of Bhadra, for the puja of the elephant-headed god Vinayaka or Ganesa, to whom they are regarded as sacred ; for this purpose the bluish corona, or central column, is carefully picked from the petals and then strung into garlands. A Hindu is forbidden by the Sastras to marry a third woman, and a ceremony of marriage to an akand plant is performed after the death of a man's second wife before marriage to a third wife can be completed. After the ceremony the tree is cut down.

The tree is indigenous almost throughout the plains of India, but is largely replaced in some of the dryer parts by *C. procera* Br., a very similar but smaller shrub with broader petals. In Bengal *C. gigantea* is very common in waste places and on roadsides. It is rather scarce in the city of Calcutta, but specimens may be seen in waste places where the seed has been carried by the wind.

The flowers and fruit appear almost all the year round, but the flowers are most abundant in the hot weather. The foliage is evergreen. Two varieties are found, the commoner with purplish or mauve flowers, and the less common with almost pure white flowers. Intermediate varieties do not seem to occur, although the two varieties may be found growing side by side. The two forms seem to be exactly the same in all respects except in the colour of the flowers and in size ; for the white variety does not appear to attain such large dimensions as the common variety.

The bushes may sometimes be found almost covered with large grasshopper-like insects with brilliant green and red colouring, which feed on the leaves and stems.

# LOGANIACEAE

A family including about 32 genera with 400 species of trees, shrubs, and herbs, many of them climbers, nearly all natives of the tropics. The leaves are arranged in opposite pairs, the stalks being usually connected by a small sheath (interpetiolar stipule), or by a raised line. The flowers are symmetrical and usually bisexual with 4 or 5 calyx-segments, and 4 or 5 petals partially joined at their base to form a tube, inside which the same number of stamens are attached alternating with the petals. The ovary is not attached to the calyx and contains 2 chambers (cells). The fruits take various forms. The family is not unlike *Rubiaceae* but the ovary is free from the calyx (superior).

The family takes its name from *Logania*, an Australian genus not found in India. In Indian and European gardens the family is represented by a number of beautiful shrubs of the genus *Buddleia*, several species of which are found in the Himalayas and other Indian hills.

**STRYCHNOS.** (An ancient Greek name used by Theophrastus). A genus of about 70 species of trees and climbing shrubs, natives of the tropics. The flowers have 5 petals which do not overlap, and 5 stamens included in the tube formed by the petals. The fruit is a berry with a hard rind containing large seeds embedded in fleshy pulp.

In addition to the tree described below, two other species occur in some parts of Bengal, including *S. potatorum* Linn. f. (Bengali, *nirmali*), a tree with narrow pointed leaves and small berries containing 1 or 2 seeds, which are commonly used for clearing muddy water.

**Strychnos Nux-vomica** Linn.

(Nux-vomica is Latin meaning "ulcer-nut".)

| | |
|---|---|
| Bengali, | *kuchila, thalkesur.* |
| Hindi, | *kuchla, kajra, nirmal, bailewa, chibbinge.* |
| Urdu, | *azaraki, kuchala.* |
| English, | *nux-vomica tree, strychnine tree, poison nut, crow fig, kachita.* |

(F.I. p. 193. F.B.I. Vol. IV. p. 90. B.P. Vol. II. p. 704.)

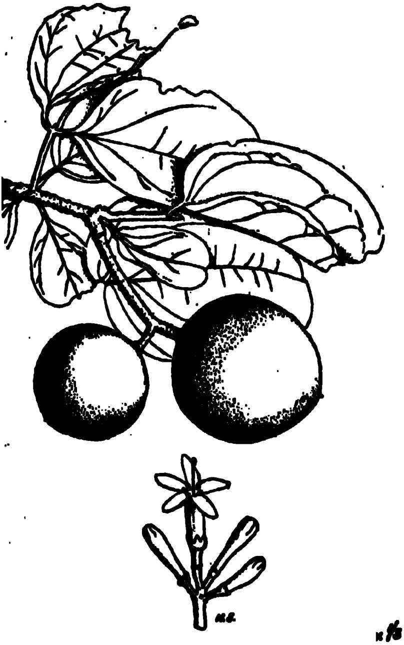
An almost evergreen tree, sometimes spinous ; leaves opposite, ovate or broadly elliptic, acute or obtuse, shining, base usually rounded, 5-nerved at base, 3 to 6 inches long ; petiole ¼ to ½ inch long ; flowers in terminal pedunculate compound cymes, greenish white, about ½ inch long ; calyx lobes acute ; corolla tube cylindric, ⅓ inch long, lobes about 1/10 inch long ; berry globose, slightly rough but shining, orange-red when ripe, up to 3 inches across.

This is a large or middle-sized tree with a short, thick trunk, smooth, greyish bark, and shining, oval, dark green leaves set on short stalks in opposite pairs. Three strong nerves reach from the base of the leaf nearly to the tip, and one weaker nerve spreads on each side of them from the same point. The small greenish-white flowers, which smell strongly of turmeric, grow in open clusters at the ends of the branches. The five pointed petals are joined for most of their length to form a slender tube, which encloses the stamens, but the style projects beyond the mouth of the tube. The fruit is a large shining berry, when ripe about the size and colour of an orange, with a hard rind containing several flat, silvery, circular seeds set in soft white pulp.

The highly poisonous seeds of this tree yield the important drug known as *nux-vomica*, or strychnine, which is extensively used in European, as well as Indian, medicine as a tonic and stimulant. Large quantities of the seeds are exported from Bombay and South India for this purpose. In India the fruit is used to cure diseases of the blood, anaemia, jaundice, lumbago, and several other disorders. The leaves are applied as a poultice to wounds, and the root-bark, ground into a paste with lime-juice, is said to be effectual in cholera. The wood is given as a remedy for dysentery, fevers, and dyspepsia, and the juice from the wood is believed to be a cure for cholera and acute dysentery.

The seeds are very poisonous to most animals, but are eaten by langurs and several kinds of birds. The pulp which surrounds the seeds contains a little poison, but is much sought after by birds and flying foxes. It is even said that the pulp is eaten by men in some parts of India.

The wood is hard, close-grained, and durable, weighing about 54 lb. per cubic foot. It is not attacked by white ants, and is used for cart-wheels and furniture-making.



*STRYCHNOS NUX-VOMICA*

The seeds yield a dye which give a brown colour to cotton cloth. They are used to poison fish, and are sometimes added to country spirit in order to make it more intoxicating.

The tree is indigenous in most parts of the plains of India and is common in the South. It is not wild near Calcutta, but is occasionally planted in gardens for its ornamental foliage. A specimen may be seen in the Royal Agri-Horticultural Garden at Alipore.

The new leaves appear early in the hot season, and are closely followed by the flowers. The young foliage is reddish in colour. The fruits ripen in the cold weather.

# BORAGINACEAE

A family including about 85 genera with over 1200 species, mostly herbs and natives of tropical and warm countries. The leaves are usually not divided into separate leaflets, and not set in opposite pairs. The flowers are usually bisexual and symmetrical, and are often arranged in one-sided spikes or clusters. The calyx is not joined to the ovary, and is divided into 4 or 5 lobes. The petals are partially joined to form a funnel or tube, inside which the stamens are attached, alternating with the petals. The fruit is a berry, or a cluster of 4 small nuts. Usually the plants are more or less covered with coarse hairs.

This family is best known by a number of herbs with small blue flowers, grown in gardens throughout the world, e.g. *Cynoglossum, Anchusa,* and *Myosotis* (the forget-me-nots). In Bengal the family is represented by a number of common weeds, including *Heliotropium indicum* Linn. (Bengali, *hatisura*). The family takes its name from the genus *Borago,* which includes *B. officinalis* Linn., a herb common in Europe.

**CORDIA.** (Named after V. Cordus, a German botanist, 1515-1544). A genus of about 230 species of trees, shrubs, herbs, and climbers, mostly American. The flowers are often of 2 kinds, male and bisexual, both kinds being found on the same tree (polygamous). The calyx is bell-shaped, or tubular, with 4 or 5 short teeth. The petals number 4 to 8, and are partially joined to form a funnel. The ovary terminates in a twice-forked style. The fruit is a berry containing 1 stone within which are 1 or more seeds.

About 13 species are indigenous in India, and one foreign tree is often planted there.

**Cordia dichotoma** Forst. *Syn.* C. Myxa *Linn.*

(Dichotoma means with forked branches.)

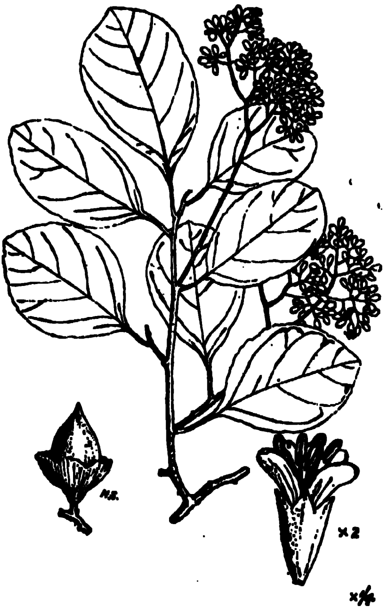
| | |
|---|---|
| Bengali, | *bohari, buhal, bahubara, bohodari, lashora.* |
| Hindi, | *lasora, bhokar, gondi, rasalla.* |
| English, | *sebesten, Indian cherry, clammy cherry.* |

(F.I. p. 198. F.B.I. Vol. IV. p. 136. B.P. Vol. II p. 714.)

A middle-sized tree; leaves alternate, glabrous but rough, broad-ovate to elliptic, base often rounded but not cordate, entire or slightly dentate, 3 to 6 inches long; petiole 1 to 2 inches; flowers small, polygamous, fragrant, in terminal and axillary cymes, whitish; calyx tubular-campanulate about 1/6 inch long, in flower, soon accrescent, becoming campanulate or saucer-shaped, up to ¾ inch diam. in fruit; corolla-lobes about ⅛ inch, tube hairy within; berry yellow, pink, or nearly black, shining, ovoid, 1-seeded, ½ to ¾ inch long.

This is a low but spreading tree having a crooked trunk, rather rough, grey or brown bark with shallow cracks and furrows, and many drooping twigs. The hairless, but rough, leaves vary greatly in shape, but are always set on rather long stalks and not in opposite pairs; their margins are usually more or less toothed near the apex of the leaf but smooth near the base. The very small, whitish, scented flowers grow in loose clusters at the ends of the branches and among the leaves; they are of two kinds, male and hermaphrodite, both sorts being found mixed on the same tree. The fruit consists of a shining, egg-shaped berry, yellow, pink or nearly black when ripe, containing a single seed set in sweet, viscid, almost transparent pulp.

The fruits have a pleasant taste and, though soft and clammy are eaten by men as well as much sought after by many kinds of birds and animals. The sticky pulp is made into pickles and preserves, and is used as birdlime. It is also employed for marking linen, and in the preparation of country spirit. The kernels have a disagreeable smell when cut, but taste like filberts and are often eaten.



CORDIA DICHOTOMA

The bark is used for making ropes, and the leaves for dyeing. The leaves are also collected as fodder for cattle, and in Burma for wrapping cheroots. The lac insect feeds on the tree.

The wood is fairly strong and seasons well, but it is rather soft and readily attacked by insects. The weight varies from 23 to 42 lb. per cubic foot. It is used for boat-building and agricultural implements, and is said to be one of the best woods for making fire by friction.

The mucilaginous pulp of the fruits is used in the treatment of coughs and disease of the chest, and as a gargle. It is also given as a laxative. The kernels are said to be a good remedy for ringworm. The bark and the unripe fruit are prescribed as a mild tonic, and the leaves are applied to ulcers and to pains in the head.

The tree is indigenous throughout the plains of India and Ceylon, and extends from Egypt to Australia. It is not uncommon in thickets and village shrubberies near Calcutta, and is sometimes planted. A specimen may be seen (in 1943) near the north-west corner of the Calcutta Zoological Gardens.

The flowers appear from March to May and the fruits ripen during the rains. The foliage is nearly evergreen.

**Cordia Sebestena** Linn.

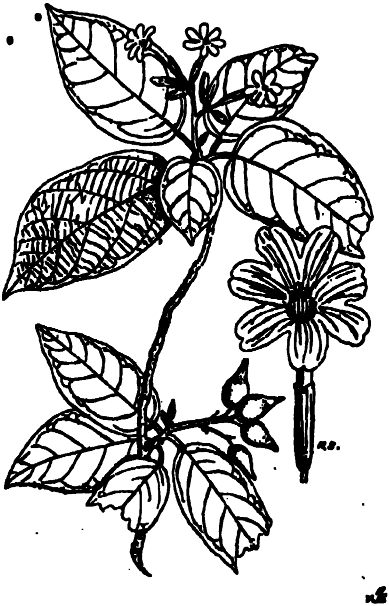
(Sebestena is a vernacular name of the tree derived from the Persian word "sapistan", which is the name in Persia of a similar species).

| | |
|---|---|
| Hindi, | *bhokar, bohari.* |
| English, | *scarlet cordia, aloe-wood, sebesten plum, geiger tree.* |

(B.P. Vol. II. p. 714. Not in F.B.I. and F.I.)

A large evergreen shrub or small tree; leaves alternate, ovate or elliptic, usually obtuse, scabrous, nerves prominent below, 4 to 6 inches long; petiole about 1 inch; flowers in lax terminal cymes; corolla orange, tube about 1½ inches long, much longer than calyx; corolla lobes usually 6 or 7, crumpled, obtuse; stamens 5 to 12, included; drupe ovoid, white, about 1¼ inches long, enclosed in the persistent calyx, usually 1-seeded.

This is a small evergreen tree or a large shrub, often with a straight trunk, but sometimes branching from the base. Its dark grey bark is rough and marked with deep longitudinal furrows and the rough, broad leaves grow on rather short stalks near the ends of the twigs, not set in opposite pairs. The bright orange-red flowers are borne in loose clusters at the tips of the branches. The blunt petals usually number six or seven, and are joined for a large part of their length to form a narrow tube, which encloses the stamens, and is much larger than the small green calyx; but the free parts of the petals spread widely above. The fruit is a white or yellowish, egg-shaped berry enclosed in the husk formed by the calyx, which enlarges while the fruit swells, the whole being reminiscent of a hazel-nut. The husk has a sweet smell when opened.



CORDIA SEBESTENA

This handsome little tree is a native of Peru, but is now widely cultivated in hot countries for its showy orange flowers, and is common in Calcutta gardens. The flowers appear almost all the year round, but particularly in the hot season and early rains. The new leaves are mostly produced in February.

In spite of its English name, sebesten plum, it does not appear that the fruit is edible.

Hindus use the burning wood, which has an agreeable smell, as incense, and the flowers are gathered to decorate the thrones of idols.

The tree is propagated by cuttings and seeds. Its growth is slow.

**EHRETIA.** (Named after G. D. Ehret, a botanical painter, born in Germany in 1708 and died in England in 1770). A genus of about 50 species of trees and shrubs, natives of the tropics, of which 7 are found in India. The small, white, bisexual flowers grow in large clusters (corymbs or panicles). The calyx is small, and the 5 petals are partially joined to form a short tube, from which the 5 stamens are usually exserted. The ovary terminates in a forked style, and contains 2 or 4 chambers (cells). The fruit is a fleshy berry (drupe) containing from 1 to 4 seeds.

In addition to the tree described below, *E. laevis* Roxb. (Bengali, *tambolli*), is found in West Bengal, and was once reported from near Serampore. This tree differs from *E. serrata* chiefly in having leaves with perfectly smooth (entire) edges, and flowers not at the ends of the branches but among the leaves.

**Ehretia serrata** Roxb. *Syn.* E. acuminata *R. Br.*

(Acuminata means "long pointed". Serrata means "with saw-like teeth".)

| | |
|---|---|
| Bengali, | *kula-aja.* |
| Hindi, | *punyan, pania, puna, punjlawai, panden, koda, kurkuna, arjun.* |
| English, | *heliotrope tree.* |

(F.I. p. 200. F.B.I. Vol. IV. p. 141. B.P. Vol. II. p. 717.)

A middle-sized evergreen tree; leaves alternate, elliptic-oblong, acuminate, serrate, nearly glabrous, 4 to 8 inches long; petiole about 1 inch long; flowers numerous, white, fragrant, in large terminal compound panicles; corolla rotate, lobes 1/8 inch long, reflexed; drupe 1/8 to 1/6 inch diam., ellipsoid, obtuse, red or nearly black when ripe; pyrenes 2, each usually 2-seeded.

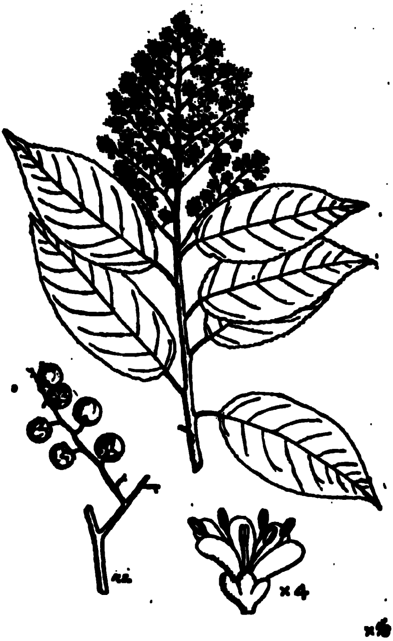
This is an evergreen tree of moderate size having grey or whitish-grey bark marked with longitudinal cracks. The rather narrow, long-pointed, saw-edged, nearly hairless leaves grow on stalks of fair length along the twigs, not in opposite pairs. With the new leaves the diminutive, creamy-white, scented flowers are produced in great profusion, forming large branching clusters at the ends of the twigs. The fruit is a very small, slightly elongated berry, orange, red, or nearly black when ripe, containing two nutlets each usually holding two seeds.

The fruits are insipidly sweet and contain little pulp, but they are sometimes eaten raw when ripe, and made into pickles before they ripen. The leaves are collected for fodder.

The wood is fairly hard and even-grained, but rough, its weight being about 40 lb. per cubic foot. It is used for building and making agricultural implements. It is said to be resemble ash-wood.

The tree is a native of the low hills of northern and north-eastern India, and extends through Burma to Japan and Australia. It is not indigenous near Calcutta, but is occasionally planted for the fine display of flowers which it produces in February and March. Two specimens may be seen (in 1942) in the Calcutta Zoo.

The leaves mostly fall in the cold weather, but are replaced soon after as the flowers open. The fruits ripen in June or July.



*EHRETIA SERRATA*

# SOLANACEAE

A family of about 75 genera with over 1500 species of herbs, shrubs, and small trees, mostly natives of America. The leaves are usually not set in opposite pairs. The flowers are solitary, or in small clusters (cymes), and are usually bisexual and symmetrical. The calyx is not attached to the ovary, and is divided into 5 segments, which are joined at the base. The 5 petals are more or less joined, and the stamens usually also number 5, and alternate with the petals. The fruit is usually a berry, but sometimes a capsule, and contains many flat seeds.

This is an important family containing many plants that are useful to man, and some that are grown in gardens. In addition to the genus *Solanum* (see below), a number of members of this family, mostly herbs, are found in Bengal. Five or six species of *Capsicum* (Bengali, *mirich*), the chillies, are commonly cultivated, as also are two species of *Nicotiana*

(Bengali, *tamaku*), the tobaccos; in addition several species of *Nicotiana* are grown as garden annuals, and one species, *N. plumbaginifolia* Viv. (Bengali, *ban tamaku*) is a common weed. Three species of *Datura* (Bengali, *dhutra*), well known for their very poisonous seeds and valuable medicinal qualities, are common in gardens and waste places. *Petunia nyctaginiflora* Juss. is a very popular garden annual, which flowers in the hot season. *Physalis peruviana* Linn. (Bengali, *tipariya*), the cape gooseberry, is a valuable fruit often grown in Bengal, and *P. minima* Linn. (Bengali, *ban tipariya*) is a common weed of gardens. *Lycopersicum esculentum* Mill. (Bengali, *gut begun*), the tomato, is now much cultivated in the plains of India.

**SOLANUM.** (An ancient Latin name of unknown origin). A genus of about 1,000 species, mostly natives of South America, but found throughout the world. The free parts of the petals are plaited when in bud and wide-spreading in flower. The anthers are prominent and open by pores at the apex to release the pollen. The fruit is a berry not enclosed by the calyx.

This very large and important genus contains a number of plants of great economic importance as well as several shrubs and climbers found in Indian gardens, and many weeds, which include some of the commonest of Indian plants. *S. tuberosum* Linn. is the potato, and *S. Melongena* Linn. (Bengali, *baigun*) is the brinjal or egg-plant, both of which are too well-known to need description. *S. indicum* Linn. (Bengali, *byakur* or *gurkamai*), and *S. trilobatum* Linn. are common shrubby weeds with pale blue flowers, and *S. torvum* Swartz. (Bengali, *gota-begun*) is a tall shrub with white flowers and lobed leaves. *S. nigrum* Linn. (Bengali, *gurkhi*), the black nightshade, is a small weed of fields and gardens, and is one of the very few plants found wild both in Great Britain and in lower Bengal.

**Solanum verbascifolium** Linn. *Syn.* S. pubescens *Roxb.*

(Verbascifolium means with leaves like *Verbascum*, i.e., the mullein. Pubescens means "downy").

| | |
|---|---|
| Bengali, | *arasa, urusa.* |
| Urdu, | *ola.* |
| English, | *potato tree.* |

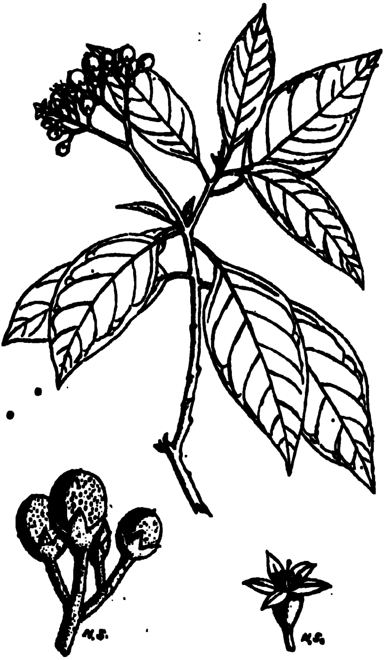
(F.I. p. 189. F.B.I. Vol. IV. p. 230. B.P. Vol. II. p. 746.)

A large shrub or small tree, unarmed, densely stellately woolly; leaves elliptic, acuminate, entire, 4 to 8 inches long, pale beneath; petiole 1 to 2 inches long; flowers in dense, subterminal, compound corymbs, white, or occasionally pale blue, about ½ inch across; calyx lobes triangular, 1/12 inch long in flower; corolla woolly without; ovary hairy, style glabrous; berry globose, 1/3 inch diam., yellow, stellate when young.

This is a large evergreen shrub, or sometimes a small tree with a thick shady crown, having smooth, grey bark, and all its softer parts covered with woolly down. Its narrow, long-pointed leaves have smooth unbroken edges, and are clustered on rather short stalks near the ends of the branches; they are dark green above but pale beneath. The small, white (or occasionally pale blue) flowers grow in dense, woolly clusters near the ends of the twigs; they are typical of the genus, having five spreading petals and five prominent anthers like the well-known flower of the potato plant. The fruit consists of a yellow berry about the size of a cherry.

In the south of India this plant is cultivated for its fruit, which is eaten in curries. Dried parts of the plant are sometimes mixed with warm water and applied to lessen inflammation and pain. It is also considered good for burns. The wood is soft and of little value.

This plant is indigenous in most parts of India, Malaya, tropical Australia, and tropical America. It is not common near Calcutta but is found in thickets and waste places. The flowers appear from July to December, and the fruits mostly in November and December.



*SOLANUM VERBASCIFOLIUM*

**Solanum macranthum** Dun. *Syn*. S. maroniense *poit*.

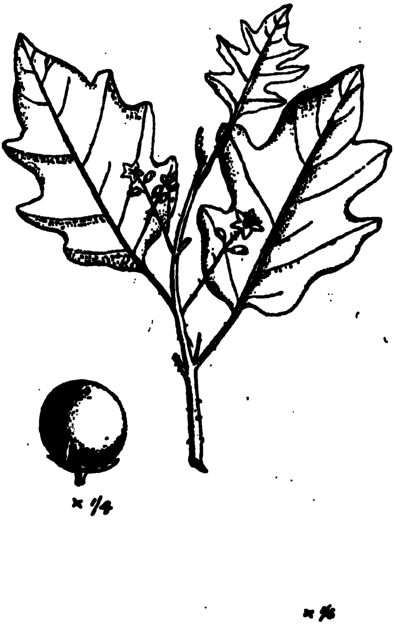
(Macranthum is from the Greek, meaning "with large flowers". Maroniense means "from the Maroni River".)

English, *potato tree, large-flowered nightshade.*

(Not in F.I., F.B.I. & B.P.)

A tall shrub or small tree with straight spines; leaves 10 to 15 inches long, irregularly angled, lobed, or pinnatifid, pale beneath with stellate pubescence, sometimes narrowed at base to a short winged petiole, armed beneath on the nerves; flowers in 7- to 12-flowered racemes or panicles 3 to 5 inches long; corolla bluish-violet fading to white, 1½ to 2½ inches diam., lobes acute; anthers large, yellow; berry subglobose, about 1½ inches diam.

This is a large shrub or a small, fast-growing tree, its spreading branches armed with numerous, yellowish-brown, straight spines. The large, irregularly-shaped leaves are partially divided into several deep lobes or angles, and are narrowed at the base to a short stalk, which often has a leafy wing on either side; on the lower side the leaf is covered with pale down, and strongly armed with long prickles along the nerves. The large flowers grow in clusters on stalks of fair length ; their petals on opening are of a fine bluish-purple, which is accentuated by the conspicuous orange or yellow anthers at their centre, but the petals soon fade to white and expand in size as they do so, until the final diameter of the flower is nearly twice its size when it first opens. The blooms have the typical shape of the genus, which is so familiar in the flower of the common potato. The fruit is almost the size and shape of a golf ball.



*SOLANUM MACRANTHUM*

This is a very handsome little tree owing to its large, deeply cut leaves and beautiful clusters of flowers, a mixture of purple and white. It is a native of Brazil but is now often grown in tropical gardens and is not uncommon in Calcutta. The flowers appear from March to November.

The tree is easily propagated from seeds or cuttings, but the wood is soft, and the branches are liable to be damaged by high winds. It therefore needs shelter, and should be occasionally pruned.

# BIGNONIACEAE

A family of about 60 genera with over 500 species of trees, shrubs, and woody climbers, mostly tropical and largely South American. The leaves are usually divided into separate leaflets and set in opposite pairs. The flowers are bisexual and usually unsymmetrical. The calyx is not attached to the ovary, and usually has 5 teeth or lobes. The 5 petals are partially joined to form a bell- or funnel-shaped tube, on the inside of which the stamens, which usually number 2 or 4, are attached. The ovary is supported by a disc and terminates in a slender style. The fruit is usually an elongated capsule containing two chambers (cells) and numerous winged seeds.

This family is of little economic importance, but includes a number of the most beautiful trees and shrubs to be found in tropical gardens and in this respect ranks second only to the *Leguminosae*. The family takes its names from *Bignonia*, a genus of climbers, of which several species are grown in Indian gardens; of these the best known is *B. venusta* Ker., which has orange flowers.

Several trees and large shrubs of the genus *Tabebuia* are sometimes planted in Indian gardens, but all are scarce and rarely to be found outside botanical collections. The genus is closely allied to *Tecoma*, with which it is combined by some authorities, though by others it is separated chiefly on account of the arrangement of the leaflets, which radiate outwards from the end of the leaf-stalk (digitate). *Tabebuia rosea* DC. (*Syn. Tecoma rosea* Bertol.) is a tall evergreen tree with rosy-pink flowers, and 3 or 5 long-stalked, taper-pointed leaflets. *Tabebuia spectabilis* Nichols (*Syn. Tecoma spectabilis* Planch & Lind.) has large yellow flowers nearly 3 inches long, grouped in clusters at the ends of the twigs. It flowers in March and April when the tree is bare of leaves, and is then a beautiful sight. The leaves are produced soon after the flowers and have 5 rather broad, notched leaflets. A small tree growing on the north side of Dalhousie Square probably belongs to this species.

Another genus of trees occasionally planted in Indian gardens is *Markhamia*. This comprises several species with large leaves and yellow flowers, often marked with red lines inside the tube of the petals. The genus is closely-allied to *Spathodea* but differs in the capsule, which contains a partition running parallel to the valves by which the capsule opens (i.e., a false septum which is much larger than the small true septum).

**OROXYLUM.** (From the Greek "oros", a mountain, and "xulon", wood.) A genus with a single species, distinguished by its very large leaves divided into leaflets, of which some are attached to branches of the midrib (bipinnate), or even to subdivisions of the branches (tripinnate). The petals are joined to form a wide tube; and the stamens number 5. The fruit is a large flattened capsule opening by 2 valves which are parallel to the central partition.

**Oroxylum indicum** Vent. *Syn.* Bigninia indica *Linn.* Calosanthes indica *Blume.*

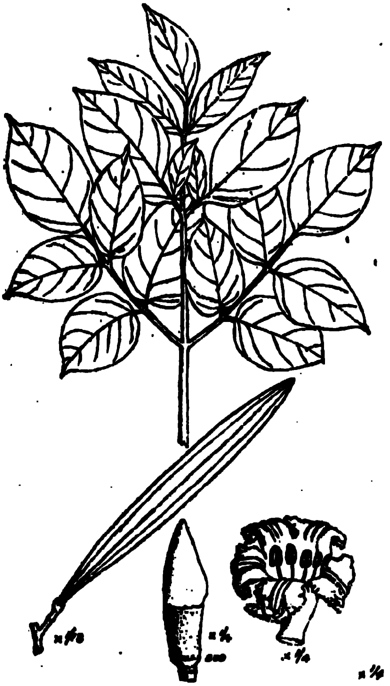
(Indicum means "of India".)

| | |
|---|---|
| Bengali, | *sona, nasona, sonpatti.* |
| Hindi, | *ullu, karkath, syonu, pharri, arlu, pharkath, sauna, assar sauna.* |
| Urdu, | *arlu.* |
| English, | *Indian trumpet flower, midnight horror, tree of Damocles, midday marvel, broken bones.* |

(F.I. p. 495. F.B.I. Vol. IV. p. 378. B.P. Vol. II. p. 787.)

A small, deciduous, glabrous, soft-wooded tree; leaves opposite, pinnate at the apex, bipinnate or tripinnate near the base, 3 to 5 feet long; leaflets ovate, acuminate, 3 to 8 inches long, petiolule about ½ inch long; flowers in erect terminal racemes, evil-smelling; peduncles long, stout, rough; calyx coriaceous, fleshy, 1 inch long; corolla campanulate, fleshy, 2 to 3 inches long and wide; stamens 5, exserted, subequal; capsule flat, woody, scarcely ½ inch thick, 15 to 30 inches long by about 2½ inches wide; seeds winged, 2 to 3 inches long.

This is a small but conspicuous tree, ungainly, grotesque, and monstrous in almost all respects. Its growth is very swift, and the saplings shoot upwards rapidly without branching till they reach a height of about fifteen feet when their first flowers appear, after which they almost stop growing; but buds break out lower down on the stem and develop into new branches, which grow stiffly upwards with their foliage clustered near the top. The bark is thick, and light greyish-brown in colour, and yields a green juice when cut. The enormous leaves are divided into numerous large leaflets, and may well be mistaken for separate branches; but each develops as a unit and, when it withers, breaks up gradually from the tip to the base. Near the apex of the leaf the leaflets are attached to the midrib in opposite pairs with a terminal leaflet at the tip; but nearer the base of the leaf they are attached to branches of the midrib, or sometimes even to divisions of these branches. The large flowers grow in stiff, erect clusters at the ends of the stems; the calyx is thick and leathery, and the petals are joined to form a fleshy, bell-shaped tube, dark purplish or whitish in colour, from which the five stamens are exserted together with the slender style. An evil odour is produced by the flowers, which is especially noticeable at night, this being an adaptation to attract bats, which are the principal agents in the pollination of the flowers. The large, flat, sword-shaped pods hang in a menacing fashion from the tips of the branches, black in colour, and sometimes rattling in the night breeze. They contain a number of flat thin seeds with broad silvery wings, which are eventually carried away by the wind.



OROXYLUM INDICUM

The bark and fruits are used as a mordant in dyeing and tanning. The large membranous seeds are employed in lining hats, and are sometimes placed between two layers of wickerwork to make umbrellas. In Sikkim they are hung up in strings from the roof of Buddhist monasteries as ornaments.

The wood is yellowish-white and soft, weighing about 30 lb. per cubic foot. It is of little or no use.

The root-bark is used medicinally to cure diarrhoea and dysentery. The bark is given as a tonic, and a powder made from it is said to be a useful remedy for the sore backs of horses. The bark is also prescribed to cure rheumatic swellings. The seeds are purgative, but in times of scarcity are sometimes parched and ground into flour.

This plant is indigenous in Malaya, China, Ceylon, and most parts of India. It is not common near Calcutta, but is sometimes planted, and also occurs spontaneously. Several specimens may be seen (in 1942) in Belvedere Road, near the police hospital.

The flowers appear from May to August. They are said always to open at midnight, but they do not fall during the following day and remain open for some time. The huge fruits ripen at the end of the rains or later. The leaves turn a dull purplish colour during the cold season, and the leaflets break off and fall singly, leaving the main stalks to fall later and to accumulate in heaps at the foot of the tree.

From February to May the trees are bare of leaves, but their branches are usually hung with a few pendulous black pods, at least until the new leaves appear.

**MILLINGTONIA.** (Named after Sir Thomas Millington, a botanist and physician to William and Mary, 1628-1704). A genus containing a single species, distinguished by the very slender tube formed by the petals, and by the leaves which are divided into a number of separate leaflets, some of which are attached to branches of the midrib of the leaf (bipinnate), or even to subdivisions of the branches of the midrib (tripinnate). The fruit is a slender capsule opening by 2 valves, which are parallel to the central partition.

**Millingtonia hortensis** Linn. f. *Syn.* Bignonia suberosa *Roxb.*

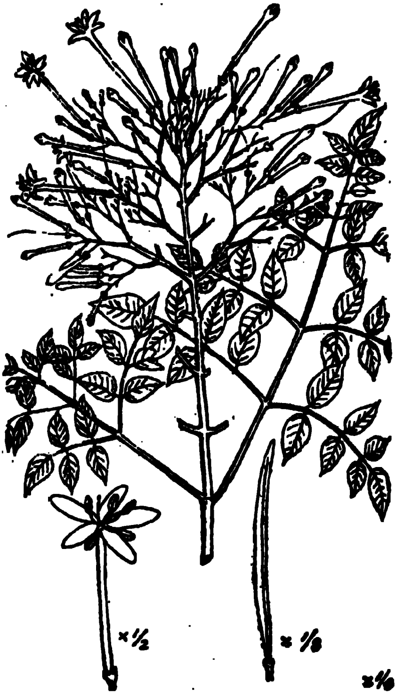
(Hortensis is Latin meaning "pertaining to a garden". For a long time the tree was only known in cultivation and its habitat was unknown. Suberosa means "corky".)

| | |
|---|---|
| Bengali, | *akas-nim, mini-chambeli.* |
| Hindi, | *akas-nim, mini-chambeli, belati nim.* |
| English, | *Indian cork tree, tree jasmine.* |

(F.I. p. 495. F.B.I. Vol. IV. p. 377. B.P. Vol. II. p. 788.)

A tall, evergreen tree; leaves opposite, 2 to 3 feet long, imparipinnate at the apex, bipinnate or tripinnate at the base; leaflets ovate-lanceolate, acuminate, crenate or sinuate, pubescent when young, 2 to 3 inches long; flowers in terminal panicles; calyx campanulate, 1/12 inch long; corolla white, tube slender, up to 4 inches long, mouth 1 inch diam., lobes 5; stamens exserted, anthers white or yellow; capsule linear, 12 inches long or more; seeds with fine transparent wings.

This tall, stately tree has a straight trunk, thick yellowish-white bark, and branches that tend to rise almost vertically at the base and to droop at the tip, giving the tree a slender and graceful outline. The large leaves are delicately divided into a number of broad leaflets with long points and wavy edges set on short stalks. Near the apex of the leaf the leaflets spring direct from the midrib, and there is a terminal leaflet at the tip, but those nearer the base are attached to branches of the midrib (known as "pinnae") which are sometimes again branched before the leaflets are reached. The white, delightfully scented flowers grow in large open sprays at the ends of the branches. The calyx is very small, but the petals are joined for a great part of their length to form a long slender tube, which widens slightly near its mouth, and ends in the five spreading lobes formed by the tips of the petals. Beyond the mouth of the tube the five stamens and the lengthy style project. The fruit is a narrow, compressed pod, pointed at both ends, containing numerous large, flat seeds, each almost surrounded by a fine transparent wing.



*MILLINGTONIA HORTENSIS*

This beautiful tree is a native of Burma, and was introduced into India less than two centuries ago, but is now planted all over the country and naturalised in many places. It is not very suitable as an avenue tree owing to its almost vertical branches which give little shade, and because it is liable to damage by storms; but it is grown for its graceful shape and beautiful flowers, which appear in November and December when few other blooms are to be seen. It is fairly common near Calcutta. A specimen may be seen (in 1942) on the north side of the Curzon Gardens, and another near the junction of Lower Circular Road and Hospital Road.

The tree is easily propagated from root suckers, (which it produces in large numbers, some at a great distance from the tree) and grows very quickly, sometimes reaching a height of 50 feet in twelve years. Its shallow roots and numerous suckers make it undesirable in gardens, and it should not be planted in positions where the fall of its branches might do serious damage.

The flowers are most strongly scented at night, and are adapted for fertilisation by moths with long proboscises to enable them to reach the nectar at the base of the lengthy tube. The seeds ripen about March, but are seldom produced in the north of India. The trunk is often covered with the earthy tunnels of white ants.

The wood is soft, yellowish-white, and even-grained, weighing about 40 lb. per cubic foot. If carefully seasoned to avoid discolouration it is suitable for furniture and ornamental work. An inferior kind of cork is made from the bark.

**TECOMA.** (A contraction of a Mexican name). A genus consisting of about 90 species of trees, shrubs, and climbers, mostly natives of America, with one species indigenous in the dryer parts of India. The leaves are set in opposite pairs, and are usually divided into separate leaflets. The flowers grow in clusters at the ends of the twigs. The calyx has 5 teeth, and the petals are joined into a wide tube with 5 rounded lobes. The fruit is a slender, curved, flattened capsule, which splits open to release the winged seeds by valves that are transverse to the flat surfaces of the capsule, and to its central partition.

Several shrubs and climbers of this genus are common in Indian gardens, of which the best known is perhaps *T. capensis* Lindl. (*Syn. Tecomaria capensis* Spach.), a climber with orange-red flowers. Various hybrids between this species and *Tecoma stans* Juss. are also grown. The only Indian species is a small tree with narrow undivided leaves about 6 inches long having wavy edges, and large orange-red flowers in flat clusters; this is *Tecoma undulata* G.Don., or *Tecomella undulata* Seem. It is commonly grown in gardens in the dryer parts of India, but although not rare in Calcutta in the days of Firminger, it is now seldom to be seen in Bengal. About 1938 a specimen was growing in Barrackpore Park.

Some authorities have divided this genus into 6 or more genera.

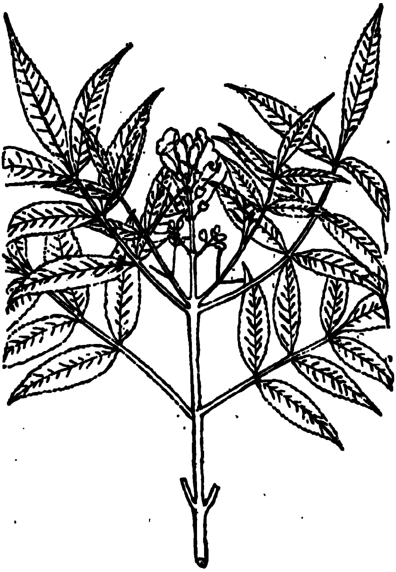
**Tecoma stans** Juss. *Syn.* Stenolobium stans *D. Don.*
(Stans is Latin meaning "erect", or "upright".)
English, *yellow elder.*

(B.P. Vol. II. p. 788. Not in F.I. & F.B.I.)

A small bushy tree; leaves opposite, decussate, about 6 inches long, imparipinnate; leaflets 5 to 11, serrate or subpinnatifid, narrow-elliptic, acuminate, glabrous, sessile, the terminal up to 3½ inches long, the lateral much smaller; flowers in small terminal racemes; calyx ¼ inch long, 5-toothed, corolla bright yellow, tubular-ventricose, 2½ inches long; lobes 5, rounded; capsule up to 5 inches long by ¼ inch wide, acuminate, compressed.

This is a pretty shrub or small tree, branching from near the base, with light brown, corky bark, and graceful, evergreen foliage.

The leaves are divided into several narrow, pointed, toothed or deeply divided leaflets set in opposite pairs on a central midrib, which terminates in an odd leaflet much bigger than the others. Most of the large, bright yellow flowers grow in small clusters at the tips of the numerous slender twigs. The petals are joined into a wide, spreading tube with five rounded lobes at its mouth. The fruits consist of long, slender capsules which hang in small groups among the leaves; they are green at first but turn brown as they ripen.



TECOMA STANS

The tree is a native of South America but is now very common in Indian gardens and is often grown in Calcutta. The typical form has leaflets that are only toothed, but there is a variety (known as *var. apiifolia*) which has its leaflets deeply incised or forked.

The wood is hard and close-grained. In the west of India the roots are believed (but apparently without any justification) to be a remedy for snake-bite and rat-bite.

The flowers appear throughout the hot weather and rains. The new leaves are mostly produced in February and March. At the end of the cold season the branches are usually laden with brown pods.

Many varieties and hybrids between this and allied species, especially *T. capensis*, are found in cultivation.

**DOLICHANDRONE.** (From the Greek, "dolichos", long, and "andron", a man, or stamen). This is a genus of about 10 species of trees, natives of Africa, Asia, and Australia. The leaves are divided into several leaflets set in two rows on either side of a central midrib with a terminal leaflet at the tip (imparipinnate). The calyx encloses the petals when in bud, and splits down one side when the flower opens (spathaceous). The petals are joined for a great part of their length to form a long funnel-shaped tube with 5 crisped or crumpled lobes. The fruit is a long capsule opening by 2 valves that are transverse to the central partition, and containing seeds with a broad wing at each end.

**Dolichandrone spathacea** K. Schum. *Syn.* D. Rheedii *Seem.* Spathodea Rheedii *Wall.*

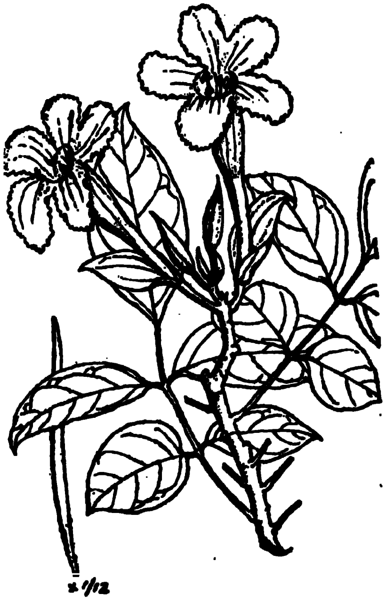
(Rheedii is a commemorative name. Spathacea means "spathe-bearing").

Bengali, *gorshingiah.*

(F.B.I. Vol. IV. p. 379. B.P. Vol. II. p. 1278. Not in F.I.)

A fairly tall deciduous tree, almost glabrous; leaves about 12 inches long, imparipinnate; leaflets 7 or 9, elliptic, acuminate, 2 to 3 inches long; petiolule about ¼ inch; flowers in few-flowered corymbs or solitary; calyx spathaceous, 1½ inches long; corolla white, 4 to 7 inches long, tubular, campanulate near the mouth; lobes crenate-toothed; capsule nearly straight, 18 inches long by 1 inch wide; seeds with corky wings, ¾ inch by 1 inch.

This is a fairly lofty tree with a rather slender outline, a trunk much fluted near the base, and pale yellowish-grey bark, which flakes off in small irregular pieces. The leaves are arranged in opposite pairs, and are divided into seven or nine narrow, pointed leaflets set on short stalks in opposite pairs on either side of a central midrib, with a terminal leaflet at the tip. At night the very large trumpet-shaped, pure white flowers open singly or in small clusters, generally at a great height from the ground. The calyx is pointed and splits down the side opposite its point, while the five petals, which are very much longer than the calyx, are joined for most of their length to form a slender tube, which widens out near its mouth and ends in the crinkled and toothed tips of the petals. The style projects beyond the mouth of the tube, but the long stamens are included. The fruit is a slender, nearly



*DOLICHANDRONE SPATHACEA*

straight capsule containing numerous seeds each with two corky wings.

The leaves fall at the end of the cold season and are replaced in March or early April. The flowers appear chiefly from March to May, when they open during the night and fall in the early morning; so they may seldom be seen on the tree, but their huge, pure white, funnel-like petals may be gathered in large numbers from the ground beneath. No doubt the flowers are pollinated by night-flying moths. The seeds are said to be adapted for dissemination by ocean currents.

The wood is white and soft, weighing about 35 lb. per cubic foot. A coarse fibre can be obtained from the bark.

The tree is a native of Malaya, Ceylon, the Andamans, Burma, and the Sundarbans. It is not wild near Calcutta but is occasionally planted for its graceful habit and its curious and beautiful flowers. A specimen may be seen (in 1944) on the east side of St. George's Gate Road, and others in the Zoological Gardens and at Belvedere.

**SPATHODEA.** (From the Greek "spathe", a spathe or ladle, in allusion to the shape of the calyx). A genus of 2 or 3 species of evergreen trees, natives of tropical Africa, differing from *Dolichandrone* chiefly in the shape of the tube formed by the petals, which is broadly bell-shaped.

**Spathodea campanulata** Beauv.

(Campanulata is Latin meaning "bell-shaped").

English, *African tulip tree, fountain tree, squirt tree, scarlet bell tree, tulip tree.*

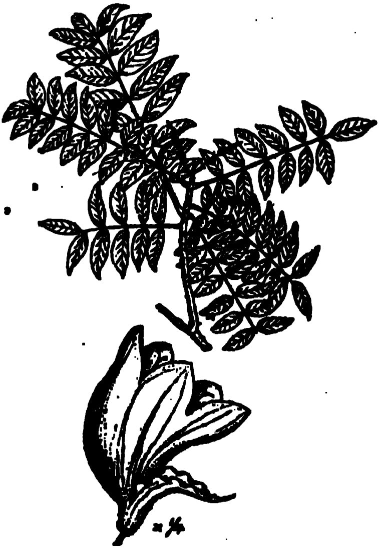
(Not in F.I., F.B.I., and B.P.)

An evergreen glabrescent tree; leaves opposite, imparipinnate, 12 to 18 inches long; leaflets 9 to 19, ovate-lanceolate, entire, abruptly acuminate, pubescent beneath when young, 2 to 4 inches long; petiolules very short; flowers in many-flowered terminal panicles; calyx coriaceous, spathaceous, recurved, 2½ inches long; corolla campanulate-ventricose, red or orange, about 4 inches long; stamens 4, exserted; capsule linear-lanceolate, acuminate at both ends, up to 15 inches long by 1¾ inches wide by 1 inch thick.

This is a fairly tall tree with light grey, fibrous bark and rather short branches, which give the tree a somewhat slender outline. The large leaves are set in opposite pairs, and divided into a number of pointed leaflets, which are rather widely spaced in opposite pairs along a central midrib with a terminal leaflet at the tip. The leaflets have very short stalks, and are minutely hairy beneath when young. In the cold weather the velvety brown flower-buds appear in spherical masses at the ends of the branches, and at the end of January, or in February, they burst into large branching clusters of erect blooms. The calyx, which covers the petals in bud, splits down one side and curves backwards to release the petals, which are joined to form a wide bell, orange and crimson outside and yellow streaked with red within. The four large yellow stamens end in brown anthers, which are exserted beyond the mouth of the bell. The free ends of the petals are bluntly pointed with wavy edges and are bordered by a fine yellow margin. An unpleasant foxy smell is emitted by the flowers, which may be adapted to attract bats; but most of the pollination seems to be effected by birds, which visit the flowers in great numbers.

The fruits are long, pointed, woody and erect; they contain many winged seeds, which ripen in June and July.

The tree is a native of Central Africa and has only been introduced into India within fairly recent years, but is now commonly planted as a decorative tree. Its evergreen foliage and handsome shape make it very suitable as a shade tree in avenues, while its magnificent display of scarlet flowers which crown the tree from the end of the cold weather till April, make it one of the very finest of ornamental trees. It is frequently found in Calcutta gardens and a number of specimens have been planted on golf courses. It can be easily propagated from suckers and by cuttings. Old trees are liable to be dangerous, for they become hollow in the centre and are apt to fall without warning.



*SPATHODEA CAMPANULATA*

The wood is white and very soft, weighing about 40 lb. per cubic foot. It is suitable for carpentry work, but is so bad as fuel that this peculiarity is the subject of an African proverb. The sides of blacksmiths' bellows are sometimes made from this wood, presumably because of its resistance to fire.

A poisonous liquor obtained by boiling the centre of the fruits is used by African hunters to poison game.

The flower-buds contain a quantity of water, and are often used by children as squirts,—hence some of the English names of the tree.

A very similar tree with a lower growth has been known in Calcutta as *Spathodea nilotica* Seem, the Uganda flame tree, or Nile tulip tree. It seems however that this is only a variety of *S. campanulata*, and is not entitled to a separate specific name. It can however be strongly recommended for small gardens, because it never attains a great size, and bears at least as fine a display of flowers as the larger tree.

**HETEROPHRAGMA.** (From the Greek "heteros", different, and "phragma", a partition, in allusion to the peculiar 4-angled divisions of the ovary). A genus of 3 species of trees, natives of India and Burma. The genus differs from *Dolichandrone* chiefly in the calyx, which has 3 to 5 lobes, and in the broader tube formed by the petals.

**Heterophragma adenophyllum** Seem.

(From the Greek "aden", a gland , and "phullon", a leaf.)

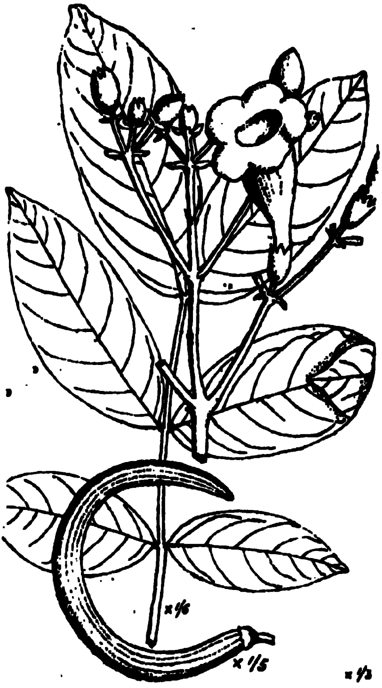
(F.B.I. Vol. IV. p. 381. B.P. Vol. II. p. 789. Not in F.I.)

A large tree, young shoots and inflorescence brown-tomentose ; leaves opposite, imparipinnate, 12 to 18 inches long ; leaflets 5, elliptic, entire, pubescent beneath, subsessile, 6 to 12 inches long ; main petiole 3 inches long, often with a pair of small leaflets at the base ; flowers in terminal, erect panicles ; calyx campanulate, about ¾ inch long, 3- to 5-lobed ; corolla yellowish-brown, tubular-ventricose, up to 2½ inches across ; capsule cylindric, ribbed, 1 to 3 feet long by 1 inch thick, often twisted ; seeds numerous, winged, about ¾ inch long.

This is a handsome evergreen tree of fair size with rather rough, brownish bark marked with longitudinal cracks, somewhat short branches, and dark green foliage consisting of very large leaves divided into five pointed leaflets, of which four are set in opposite pairs on a central midrib and the fifth is at the end of the midrib. Two additional small leaflets may often be found at the base of the midrib where it joins the stem from which it springs. The leaves are set in opposite pairs and are covered with minute down beneath. At the ends of the twigs there are erect clusters of large yellowish-brown flowers, their petals partially joined to form a swollen tube which includes the stamens, the mouth of the tube being divided into five greenish-yellow lobes. The fruit is a long, slender, cylindrical, curved capsule containing a number of winged seeds. The young stems, the flower-stalks, and the outside of the flowers are all covered with soft brown hairs.

This tree is indigenous in Burma, the Andamans, Assam, and parts of East Bengal. It is sometimes planted in Calcutta, and specimens may be seen (in 1944) on the north of the Zeerut Bridge and on the east of the Zoo. The flowers, which appear from June to August, have no claims to beauty and are not very noticeable owing to their dull colour, but the large leaves are not unattractive. At the end of the monsoon the long, twisted fruits are conspicuous. The new leaves are produced in April.

The wood is hard and weighs about 48 lb. per cubic foot. It does not warp or split and is excellent for cabinet making.



*HETEROPHRAGMA ADENOPHYLLUM*

**JACARANDA.** (A Brazilian vernacular name). A genus of about 30 species of trees and shrubs, natives of tropical America. The leaves are usually divided into many small leaflets set on either side of branches of the midrib of the leaf (bipinnate). The flowers are showy, and blue or violet in colour. The calyx is small and has 5 teeth. The petals are joined to form a curved and swelling tube with 2 lips, one of which has 2 lobes and the other 3 lobes. There are 4 fertile stamens, and one very long barren stamen (staminode). The fruit is a flat woody capsule which splits open to release the seeds.

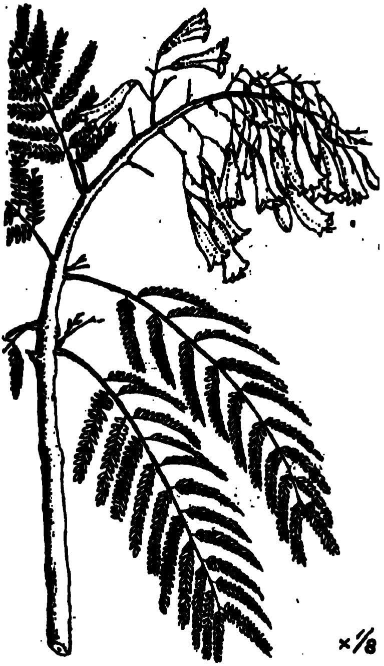
In addition to the two species described below, a number of other very similar species are cultivated in various parts of the tropics, and several have been occasionally planted in India.

**Jacaranda ovalifolia** R.Br. *Syn.* J. mimosifolia D. Don.
(Mimosifolia means "with leaves like a *Mimosa*". Ovalifolia means "with oval leaves").

English, *mimosa-leaved jacaranda.*

(Not in F.I., F.B.I., & B.P.)

A medium-sized deciduous tree ; leaves opposite, distant, bipinnate, about 15 inches long ; pinnae about 26; leaflets oblong-rhomboid, acute, 1/5 to 1/3 inch long, the terminal one larger; flowers in terminal panicles of 40 to 90 flowers; calyx small, 5-toothed; corolla bluish purple, 2 inches long; tube slender and curved below, inflated above; limb 2-lipped, the posterior 2-lobed, the anterior 3-lobed; perfect stamens 4, 2 long and 2 short; staminode longer than the stamens, exserted, clavate at the apex with 2-lobed hairy tip; capsule oblong or ovate, loculicidal.



*JACARANDA OVALIFOLIA*

This is a graceful tree, with fairly smooth, pale grey bark, and an open and rather straggling habit of growth. Its large, narrow leaves are delicately divided into a large number of small pointed leaflets after the manner of a *Mimosa*, or of *Delonix regia*, the *gul mohr*. The leaflets are set in opposite pairs along branches of the midrib of the leaf (known as "pinnae"), which are themselves set in opposite pairs on either side of the midrib. The flowers grow in large, erect, loose sprays at the ends of the branches, and are of a brilliant purplish-blue, or lilac colour. Five petals are joined to form a tube, which is slender and curved below, but expands above and ends in two lips, of which the upper has two rounded lobes, and the lower three. There are four fertile stamens, of which two are longer than the others; and there is a fifth barren stamen, which projects beyond the mouth of the tube. The style is hairless and not much longer than the four fertile stamens. The fruit is a rounded woody capsule.

This very beautiful tree is a native of Bengal, but is now extensively cultivated in warm dry countries for its handsome foliage, and for the magnificent display of flowers that it produces in suitable climates, which certainly makes it one of the very finest trees to be found in the world. It does not flourish in the damp climate of Bengal, and must be well drained if it is to survive there, but it is occasionally planted in Calcutta, and some trees produce a fair show of flowers almost every year. A specimen may be seen (in 1943) in the Belvedere Garden on the side of Alipore Road.

The wood is scented and beautifully streaked with purple and black. It is known commercially as pallisandre or pallixander wood.

In South America the leaves are used medicinally to cure diseases of the chest and wounds. An infusion of the bark is used as a lotion for ulcers.

The flowers appear in March and April, and the new leaves are produced at about the same time. This is a slow growing tree and flowers are not produced till it has been planted for many years.

**Jacaranda filicifolia** D. Don.

(Filicifolia means "with leaves like a fern".)

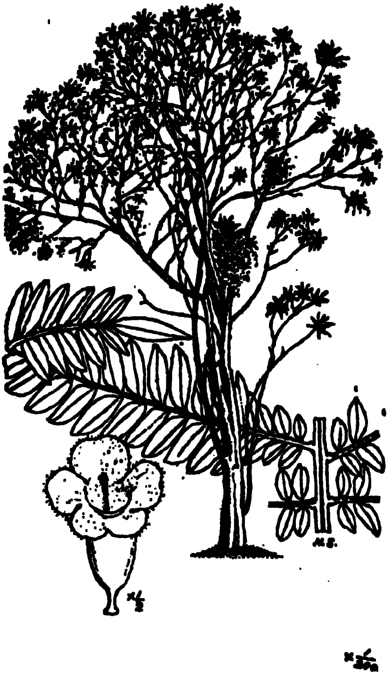
English, *fern-leaved jacaranda, green ebony tree.*

(Not in F.I., F.B.I., and B.P.)

A slender tree; leaves opposite, bipinnate, up to 15 inches long; pinnae up to 30 or more, up to 5 inches long; leaflets up to 37, elliptic, acute, about ½ inch long, subcoriaceous, nerves conspicuous; flowers in many panicles along the bare branchlets; calyx 1/10 inch long, lobes obscure; corolla 1½ inches long, bluish-purple, tube narrow and curved below, ventricose above, upper lip 2-lobed, lower lip 3-lobed, pubescent within; stamens 4, included; staminode 1, far exserted, glandular—hairy; style as long as the fertile stamens, glabrous; capsule flat, acute, loculicidal.

This graceful tree has a tall trunk covered with smooth, grey bark, and a few slender branches. Its leaves are divided into a number of small, pointed, leathery leaflets set in rows on either side of branches from the midrib of the leaf; they are arranged in opposite pairs, and are clustered near the ends of the twigs. During the cold weather the foliage mostly falls, and at the end of February, or in March, the brilliant purplish-blue or pale violet flowers appear in numerous small clusters along the bare twigs. The petals are joined to form a curved and swelling tube with two pronounced lips, one of which has two rounded lobes and the other three. From the throat of the tube projects a slender thread, covered with minute hairs, which would naturally be taken to be the style, but is actually a barren stamen, or staminode; the four fertile stamens being included, together with the small style, in the narrow and curved part of the tube. The fruit is a flat capsule, which splits open to release its seeds.

This beautiful tree may be distinguished from its better known relative *Jacaranda ovalifolia* (see above) by its larger leaflets, and by its smaller flowers, which appear earlier in the year, and grow in many short clusters close to the twigs, not in large clusters at the ends of the twigs. Unlike *J. ovalifolia* this tree will stand a great deal of damp, and therefore flourishes quite well in Bengal without special drainage. Its flowers are less handsome than those of *J. ovalifolia* at its best, but in Bengal it produces a finer show of bloom than the best specimens of *J. ovalifolia* can display in such a damp climate. Unfortunately it is difficult, or impossible, to propagate it except from seed, and seeds are seldom, if ever, produced in Bengal. The tree grows very slowly, and does not flower for many years, perhaps thirty or forty years, after it is planted. The wood is exceedingly hard.



*JACARANDA FILICIFOLIA*

A fine specimen of this species may be seen in the Royal Agri-Horticultural Gardens at Alipore, and several others grow in private gardens in Calcutta.

**PARMENTIERA.** (Named after A. A. Parmentier, who introduced potato culture into France). A genus of 2 species of shrubs or small trees, natives of Panama and Mexico. The leaves are either divided into three leaflets (trifoliolate), or undivided. The flowers grow on the trunk or older branches. The calyx splits along one side (spathaceous), and the petals are joined to form an almost symmetrical, broadly funnel-shaped tube. The stamens number 4. The fruit is slender, cylindrical or oblong, and does not split open to release the numerous seeds (indehiscent).

**Parmentiera cerifera** Seem.

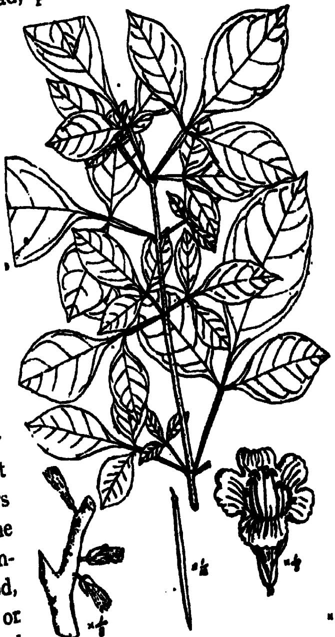
(Cerifera is Latin meaning "wax-bearing".)

English, *candle tree.*

(Not in F.I., F.B.I. and B.P.)

A small spreading tree; leaves trifoliolate, 3 inches long, rachis narrowly winged; leaflets obovate, or elliptic, acute; flowers solitary on trunk and larger branches; calyx spathaceous; corolla campanulate, lobes spreading, whitish or pink, 2 inches across; stamens 4, included; ovary sessile; fruit cylindrical, smooth, whitish, pendulous, up to 20 inches long by ½ inch thick.

This is a small tree, sometimes branched from near the base, with fairly smooth, pale brownish-grey bark, and spreading branches. Its small, bright green leaves are set in opposite pairs, and are divided into three broad, pointed leaflets, two opposite one another on either side of the midrib, and the third at the tip of the midrib. A few rather large flowers grow singly on short stalks from the trunk and larger branches of the tree, never from the young twigs. The calyx splits open down one side to release the petals, which are joined for a great part of their length to form a wide funnel-shaped tube, including only partly the four large stamens; they are usually dull white, but trees with pinkish flowers are sometimes seen. The fruit consists of a long, pendulous, cylindrical pod, smooth, shining, whitish or pale yellow in colour, and closely resembling an old-fashioned tallow candle.



PARMENTIERA CERIFERA

This tree is a native of Panama, but is grown in many tropical countries as a curiosity. It is occasionally seen in Indian gardens, and there are a few specimens in Calcutta. The flowers, which appear from May till the end of the monsoon, and occasionally at other times also, are inconspicuous owing to their dull colour and unobtrusive position on the trunk and branches. The curious fruits may be seen hanging from the trunk and branches almost throughout the year, but are most noticeable during the cold season. In the climate of Bengal they do not exceed about six inches in length, but nearer the equator they attain three times this size or more. The new leaves are produced in April.

The fruits are said to be eaten in the trees' native home, but have no other practical use.

**KIGELIA.** (An African vernacular name). A genus of about 12 species of trees, natives of tropical Africa. The leaves are divided into 2 rows of leaflets on either side of a central midrib with a terminal leaflet at the tip (imparipinnate). The large reddish flowers hang in long pendulous clusters (racemes). The calyx is bell-shaped with from 2 to 5 lobes, and the petals are joined to form a broadly bell-shaped tube, which is narrowed below, and expands into 2 lips above. The fruits are large and cylindrical, and do not split open to release the seeds (indehiscent).

**Kigelia pinnata** DC.

(Pinnata is Latin meaning "feathered", in allusion to the arrangement of the leaflets.)

English, *sausage tree, fetish tree, cucumber tree.*

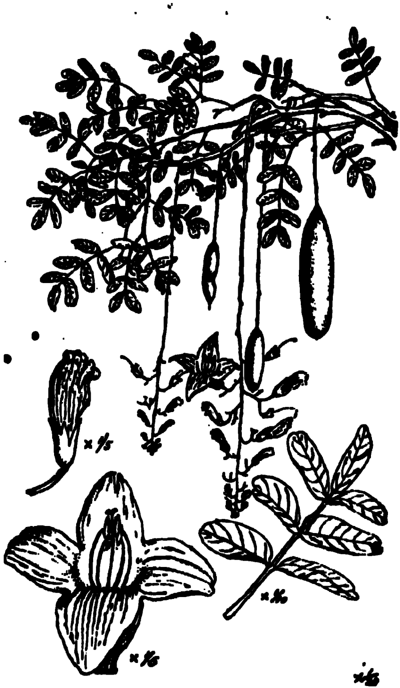
(Not in F.I., F.B.I., and B.P.)

A large spreading tree; leaves opposite, imparipinnate, glabrous or pubescent; leaflets 7 or 9, elliptic-oblong or obovate, serrate or entire, 3 to 6 inches long, the lateral leaflets sessile; flowers in long pendulous racemes; calyx campanulate, lobed; corolla deep chocolate-red, about 5 inches wide, ventricose, 2-lipped, wrinkled; stamens 4, exserted; fruit up to 18 inches long by 5 inches wide, cylindrical, obtuse, pendulous on a peduncle up to 7 feet long; seeds many, embedded in pulp.

This wide-spreading tree has a short trunk and long, distorted branches covered with rough, greyish-brown bark. The leaves are clustered near the ends of the twigs and grow in opposite pairs or in whorls. They are divided into three or four pairs of leaflets set on either side of the central midrib with a terminal leaflet at the tip. The leaflets are often widest near their tips and may have either smooth or toothed edges. From the branches the very large flowers hang in huge candelabrum-like clusters, the pendulous, rope-like stalk often reaching six feet or more in length, and sometimes dropping to within a short distance from the ground. The petals are joined to form a broad maroon or claret-coloured tube with two spreading lips, one of which has two lobes and the other three; their surface is wrinkled and striped on the outside with lighter colours, the throat of the tube being paler within. The four stamens are conspicuous, and form a lyre-shaped structure within the tube. A very unpleasant smell, rather like that of bad meat, is emitted by the flowers, and attracts large number of flies, but the tree is said to be adapted chiefly for pollination by bats, which are able to perch on their up-turned cup of petals. The immense sausage-like fruits hang, usually singly, on their long stalks, and contain many seeds set in fibrous pulp.

This very remarkable tree is a native of Mozambique and other parts of tropical Africa. It is said to have been distributed in India by the seeds obtained from a single fruit that was washed ashore in the Bombay Presidency. It is now not uncommonly planted in many of the hotter parts of India, and several specimens may be seen in Calcutta ; a small tree (which hitherto does not seem to have flowered) grows (in 1942) at the junction of Kidderpore Road and Casuarina Avenue, and a fine specimen (which flowers profusely) can be seen in the Belvedere Garden near Alipore Road. The flowers appear throughout the hot season but fruits are not very often produced in Calcutta. The new leaves mostly appear in January and February.

In several parts of Africa this tree is considered sacred, and in former times many weird ceremonies used to be performed beneath its twisted, spreading branches. Poles made of its wood are still erected as objects of veneration.



*KIGĔLIA PINNATA*

The wood is hard and of good quality and weighs about 44 lb. per cubic foot. The tree grows very quickly but, owing to its tendency to branch low down the trunk, long pieces of timber are difficult to obtain from it.

The fruits, cut in half and slightly roasted, are used as an external application in cases of rheumatism.

**CRESCENTIA.** (Named after one Crescenzi, a 13th century Italian agricultural writer). A genus of 5 species of trees, natives of Central America. The leaves are divided into 3 leaflets (trifoliolate), or undivided, and are not set in opposite pairs. The calyx is broadly lobed, and the petals are joined to form a broadly bell-shaped tube with a transverse fold in front. The stamens number 4. The fruit is large and spherical with a fleshy rind, which hardens and encloses numerous wingless seeds embedded in soft pulp.

**Crescentia Cujete** Linn.

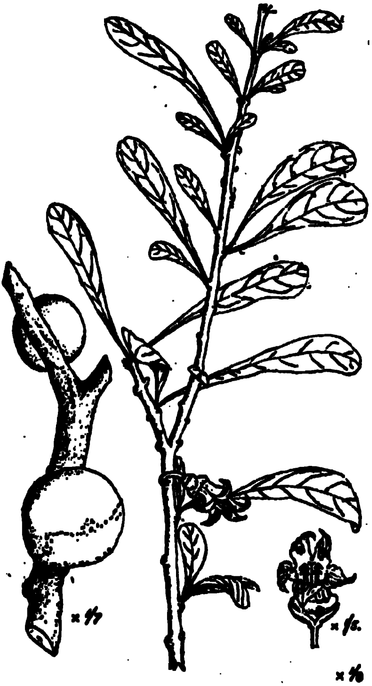
(Cujete is a Brazilian vernacular name.)

| | |
|---|---|
| Hindi, | *bilayati bel, duria bel.* |
| English, | *calabash tree.* |

(Not in F.I., F.B.I., and B.P.)

A small glabrous tree; leaves fascicled, oblanceolate, acute, base gradually narrowed, subsessile, glossy above, up to 6 inches long; flowers solitary, pendulous from the trunk and larger branches, foetid; calyx 2-parted, about ¾ inch long; corolla yellowish with purplish veins, constricted below the middle, swollen above, horizontally plicate on the anterior side, lobes 5, equal, acuminate, toothed; fruit globose, up to 7 inches diam., seeds wingless.

This is a small tree with a short straight trunk and spreading branches, which often spring from near the base of the trunk. Its bark is pale grey and marked with longitudinal fissures. The rather narrow leaves are broadest near their tips and taper gradually to their bases; they are set in clusters of two or more leaves on small knobs or swellings scattered along the twigs, and have practically no stalks. The greenish or yellowish-white flowers grow singly on short stalks from the trunk and larger branches, or sometimes from the smaller branches among the leaves, but never from the youngest twigs. The calyx has two pronounced lobes, and the petals are partially joined to form a tube, narrow at the base and inflated above, with a curious fold on the lower side. Numerous pink or purplish veins are visible on the petals, and the mouth of the tube consists of five pointed and toothed lobes. The fruit is a large, spherical gourd with a hard rind containing many seeds set in soft pulp.



*CRESCENTIA CUJETE*

This strange little tree[*] is a native of Cuba but is now commonly planted in India as a curiosity. It is occasionally found in

Calcutta gardens and several specimens may be seen in the Zoo.

In its native country the tree is much valued owing to the many uses to which its fruit can be put. The hard shell takes a fine polish, is carved into ornaments, and is made into cups and other domestic utensils. By skilful tying with ropes the fruits can be made to take various forms. The pulp of the fruit is edible.

Medicinally the fruit is used as an aperient and as a febrifuge. The ripe fruit is made into a poultice and applied to relieve headache. In the Transvaal the burnt and powdered pips are taken internally, and applied locally, as a cure for snake-bite.

The leaves fall during the cold season, and are replaced in February or March. The first blooms sometimes appear on the bare branches before the new leaves, and the flowers continue throughout the hot season and most of the rains.

## VERBENACEAE

A family of about 70 genera with 800 species of herbs, shrubs, and trees, mostly tropical and subtropical. The leaves are nearly always in opposite pairs or in whorls. The petals are joined to form a tube which is usually narrow, and often has two lips at its mouth. The stamens usually number 4. The ovary is not outwardly divided into separate divisions, but contains 2 or 4 cells each holding 1 ovule. The fruit is usually fleshy.

This family includes a number of shrubs and climbers well known in Indian gardens, and many common Indian wild plants. *Duranta Plumieri* Jacq. is a thorny shrub with small leaves, long clusters of small blue flowers, and bright yellow berries, often grown in shrubberies; it is the plant most commonly used in Bengal for hedging. *Lantana indica* Roxb. is a straggling shrub with straight, little-branched stems, and clusters of small pink flowers, common on the sides of ditches all over Bengal; and *Lantana Camara* Linn. is a thorny shrub, indigenous in Central America, with broad clusters of small orange, yellow, pink or white flowers, now run wild over large areas in India, and much cultivated in numerous varieties as a garden plant. Several species of *Clerodendron* are common in gardens and *C. infortunatum* Gaertn. (Bengali, *bhant*) is a well-known roadside weed. *Lippia nodiflora* Rich. (Bengali, *bhui-okra*) is a very abundant creeping weed of damp places with small cones of purplish flowers.

The family takes its name from the genus *Verbena*, which includes *V. officinalis* Linn., the vervain, a weed common in the south of England and occasionally found in Bengal, being one of the very few plants indigenous in both countries; it also includes several common garden plants.

**TECTONA.** (From the Greek "tekton", a carpenter.) A genus of 3 species of deciduous trees having their inflorescence and leaves covered with down, natives of India and Malaya. The leaves are large and arranged in opposite pairs or whorls of 3. The flowers are small and grow in large, erect, branching clusters (trichotomous panicles) at the ends of the branches. The petals are joined to form a short tube with 5 or 6 lobes at the mouth. The calyx is bell-shaped with 5 or 6 lobes, and is much enlarged when the fruit develops, enclosing the fruit, which consists of a hard stone embedded in a spongy covering and containing from 1 to 4 seeds.

**Tectona grandis** Linn. f.

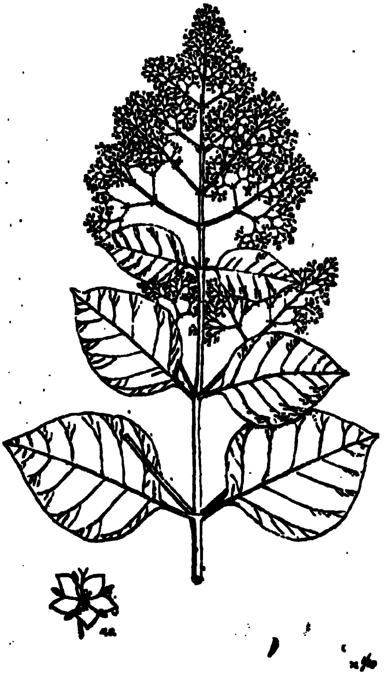
(Grandis is Latin meaning "large".)

| | |
|---|---|
| Bengali, | *segun, sagun.* |
| Hindi, | *sagun, sagon, sagwan, sakhu, segun.* |
| English, | *teak, ship tree, Indian oak.* |

(F.I. p. 202. F.B.I. Vol: IV. p. 570. B.P. Vol. II. p. 828.)

A large deciduous tree; branchlets quadrangular and channelled; leaves opposite, elliptic or obovate, acute or acuminate, scabrous above, stellately tomentose below, 1 to 2 feet long; petiole 1 to 1½ inches long; flowers white, in erect terminal panicles up to 3 feet long; calyx in flower ⅛ inch long; corolla 5- or 6-lobed, glabrous, ¼ inch across; fruit subglobose, somewhat 4-lobed, about ½ inch diam., enclosed in the expanded calyx; seeds usually 1 or 2.

This is a tall tree with an erect trunk, numerous spreading branches, and light brown or greyish bark with shallow cracks, the outer bark peeling off in long thin flakes. Its large, broad, pointed leaves grow in opposite pairs on short stalks springing from four-sided twigs; they are rough above and covered with fine pale down beneath. Many small whitish flowers grow in very large, open, branching clusters at the ends of the twigs. The petals are joined to form a short tube with five or six spreading lobes, from which five or six stamens and the style project. The calyx is very small in flower, but expands greatly to enclose the soft spongy fruit.



TECTONA GRANDIS

The teak is indigenous in most parts of the plains of peninsular India, Burma, Malaya, and the neighbouring islands. The wood is fairly hard, and very strong, and contains an oil that is strongly and characteristically scented, and acts as a preservative of the timber. Owing to the excellent quality of the wood the teak has become by far the most important timber tree in the East, and is extensively planted, in addition to the enormous natural forests largely consisting of this tree, which exist in many places, especially in Burma. The tree requires good drainage and a warm equable climate. It does not produce good timber in the plains of Bengal, and though often planted there as a roadside tree, is of little commercial value in the province. A number of teak trees may be seen on the Calcutta Maidan.

The timber is golden-yellow when freshly cut, but gradually turns darker with age. Its weight is about 45 lb. per cubic foot. It is the chief building timber in India, and is largely used for furniture, railway-sleepers, ship-building, and all purposes where good durable timber is required. It is exported in large quantities from Burma.

The leaves yield a dye that is occasionally used for colouring fabrics red or yellow. They are also useful for packing, as plates, to make rough umbrellas, and as a temporary thatch for huts. A deposit found in cracks and crevices of the wood is eaten in South India with *pan* as a substitute for lime.

Medicinally the wood is used to cure headache, biliousness, and dyspepsia, and to disperse inflammatory swellings. The ashes of the wood are applied to swollen eyelids, and are said to strengthen the sight. The flowers are used in bronchitis, and an oil extracted from the flowers is employed to promote the growth of hair. The bark is also considered a remedy for bronchitis. The flowers, roots, and seeds are diuretic.

The flowers appear from June to August, and the seeds ripen between November and January. In the moist climate of Bengal the old leaves do not usually fall till March, and are replaced in April and May. For some time before falling they have a very dingy appearance.

Teak leaves can be recognised by scratching the surface of the leaf, moistening the part with saliva, and rubbing it, whereupon a red colour is produced. The trees are conspicuous in the early part of the rains owing to their large clusters of whitish flowers, and in the cold season owing to their erect, feathery clusters of fruits.

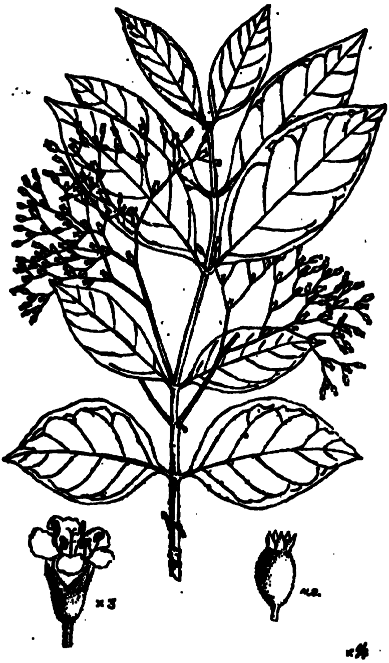
**Tectona Hamiltoniana** Wall.

(F.B.I. Vol. IV. p. 571. Not in F.I. & B.P.)

A medium-sized deciduous tree; leaves usually in whorls of 3, broadly ovate, scabrid above, stellately tomentose below, base rhomboid or obtuse, 4 to 8 inches long; petiole 2/3 inch long; flowers in terminal woolly

**panicles up to 12 inches long ; calyx in flower 1/6 inch long ; corolla 1/3 inch long, pale blue or mauve, throat very hairy ; drupe ¼ inch long, tightly enclosed in the calyx.**

This is a tree of moderate size with brownish-grey bark, which peels off in thin flakes and shows pale grey patches beneath. The rather broad, pointed leaves are rough above and covered with fine down below ; they are set on short stalks usually in whorls of three, but occasionally in pairs or in whorls of four. The small mauve, or pale blue, flowers grow in large open clusters at the ends of the branches. The petals are joined to form a tube with spreading lobes, from which the stamens are exserted. All parts of the cluster of flowers are clothed with woolly down, and the tube formed by the petals is hairy within. The fruit is a small berry almost entirely enclosed in the calyx, which expands as the fruit matures and becomes flask-shaped to hold the berry.



*TECTONA HAMILTONIANA*

This tree is a native of Burma, but has been planted in several parts of Calcutta. Two specimens grow (in 1944) on the west of Cathedral Road, and there are others in the Zoological Gardens. When not in flower it has little to recommend it, but its large clusters of flowers are pretty in a quiet way, and it is certainly worth growing as an avenue tree. The leaves fall at the end of the cold season and are replaced in March. The flowers begin to open as the new leaves appear and continue during April and into May.

The wood is light brown, very hard, and close-grained, weighing about 64 lb. per cubic foot. It is of good quality but much harder and heavier than teak.

**GMELINA.** (Named after J. G. Gmelin, a German botanist, 1709-55). A genus of about 8 species of trees and shrubs, natives of

India, Malaya, and tropical Australia. The flowers are large, the petals forming a tube, which is slender below but widens upwards with an unsymmetrical mouth. The fruit is fleshy and contains a bony stone.

Two or three thorny, climbing shrubs of this genus are sometimes grown in Bengal gardens.

**Gmelina arborea** Linn.

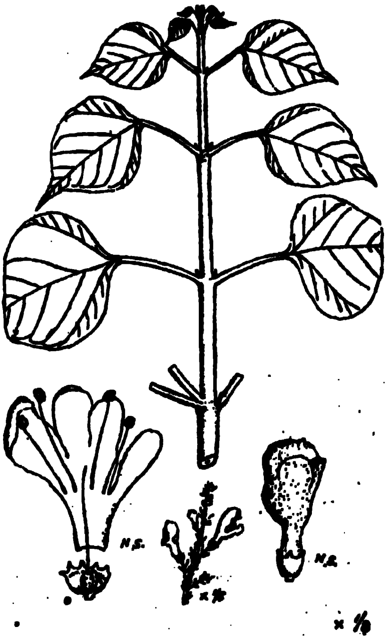
(Arborea is Latin meaning "in the form of a tree".)

| | |
|---|---|
| Bengali, | *gambar, gamari, gumbar.* |
| Hindi, | *gamhar, gambar, khamara, kumbhar, sewan.* |
| English, | *Candahar tree, Kashmir tree, coomb teak, white teak.* |

(F.I. p. 486. F.B.I. Vol. IV. p. 581. B.P. Vol. II. p. 829.)

A large deciduous tree; branchlets and young parts clothed with fine, white, mealy pubescence; leaves opposite, broadly ovate or cordate, acuminate, entire or dentate, glabrous above when mature, tawny-tomentose beneath, 4 to 9 inches long; petiole 3 to 5 inches long; flowers in a terminal panicle or thyrsus; calyx ¼ inch long, fulvous-hairy, 5-toothed; corolla brownish-yellow, ventricose, hairy outside, 5-lobed, 2-lipped, about 1½ inches long; drupe yellow when ripe, ovoid or pyriform, 1 inch long, usually 2-1-celled and seeded.

This fair-sized tree has a straight trunk covered with smooth, greyish-yellow or whitish bark, and numerous spreading branches which form a large shady head. The large, limp leaves are usually heart-shaped with long points, but sometimes they are pointed instead of being recessed at the base; they are smooth above, and hoary below, and are set in opposite pairs on very lengthy stalks. The leaves of mature trees usually have smooth edges, but those of young plants are strongly toothed. The flowers grow in rather long clusters at the ends of the branches. Their petals are joined to form a large, brownish-yellow tube ending in two spreading lips, the lower with three lobes and the upper with two; and the four stamens project beyond the mouth of the tube together with the style. The fruit is a smooth,



GMELINA ARBOREA

egg-shaped or pear-shaped berry, orange-yellow when ripe ; it contains a juice which leaves a long-lasting yellow stain on the fingers.

The wood is yellowish or greyish with a glossy lustre, and is soft, light, strong, and even-grained, weighing about 35 lb. per cubic foot. It is very durable and neither warps nor cracks, and closely resembles teak in most respects. It is easily worked, and highly valued for planking, furniture, door-panels, and ornamental work. It is specially esteemed for boat-building, and making sluices, because it is very durable under water, and is also made into drums.

The leaves are used as fodder and are much eaten by deer and other wild animals. The fruits are eaten by Gonds and by certain hill tribes. The Santals are said to use the wood-ashes and the fruit for dyeing.

Medicinally the tree is used for wide variety of purposes. The root is said to be useful in abdominal pains, burning sensations, fevers, and hallucinations. The flowers are used in leprosy and blood diseases. The fruit is sour and acrid ; it is prescribed as a tonic, to promote the growth of the hair, and in the treatment of anæmia, leprosy, ulcers, and consumption. The juice of the leaves is employed as a lotion for wounds and ulcers.

The tree is indigenous in most parts of the plains of India and Burma, but is nowhere abundant. It is not wild in lower Bengal, but is occasionally planted in gardens and villages, and on roadsides. A specimen may be seen (in 1943) on the north side of the Calcutta Zoo.

In Calcutta the new leaves appear in February and March, but in dryer climates this takes place later in the year. The flowers appear from February to April, often before the new leaves are open. The tree is bare of leaves for a short time, but the first flowers often appear before the old leaves have fallen. The fruits ripen from April to July.

When not in flower this tree closely resembles *Trewia nudiflora* Linn., but the latter may be distinguished by the raised line that joins the bases of each pair of opposite leaf-stalks.

**VITEX.** (The classical Latin name of *Vitex Agnus-castus* Linn., a South European shrub). A genus of about 70 species of trees and shrubs, natives of tropical and temperate countries. The leaves are nearly always divided into from 3 to 7 narrow leaflets, which radiate outwards from the end of the leaf-stalk (digitate). The petals are joined below to form a tube, which has two distinct lips. The stamens are in two unequal pairs and are exserted beyond the petals. The fleshy fruit contains a hard stone holding from 1 to 4 seeds.

About 12 species of this genus are indigenous in India, and several are occasionally grown in gardens as ornamental shrubs.

**Vitex Negundo.** Linn.

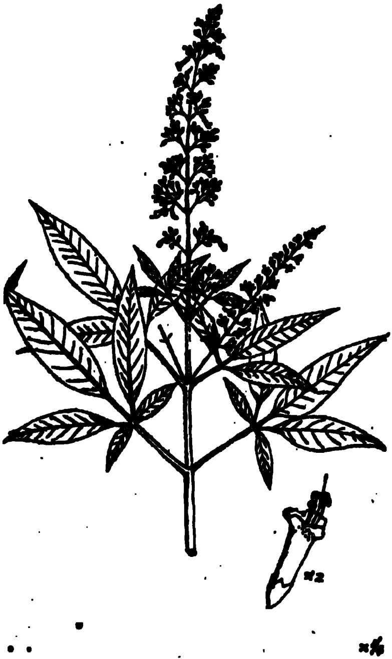
(Negundo is an old generic name for certain maples with divided leaves).

| | |
|---|---|
| Bengali, | *sandbhalu, nishinda, samalu, nirgundi.* |
| Hindi, | *sanbhalu, nirgandi, sindhuka, shiwari, nengar, mewri, sambhal, sinduari.* |
| English, | *Indian privet.* |

(F.I. p. 481. F.B.I. Vol. IV. p. 583. B.P. Vol. II. p. 833.)

A shrub or small tree; leaves opposite, up to 6 inches long, 3- or 5-foliolate, the terminal leaflet largest, up to 3 inches long, the lateral subsessile, up to 2¼ inches long; leaflets elliptic, acuminate, acute, entire or crenate, glabrate above, closely white-tomentose beneath; flowers in terminal, erect, narrow, tapering panicles up to 6 inches long; calyx campanulate, 5-toothed; corolla ¼ to ⅓ inch long, violet, lobes 5, the anterior much the largest, throat hairy; stamens 4, exserted, drupe black, ovoid.

This is a shrub or a small tree with fairly smooth, greyish-brown bark and rather slender branches. The leaves are divided into three or five (usually three) slender, pointed leaflets, which radiate from the end of the leaf-stalk. The leaflets may have smooth or indented edges, but are always practically hairless above and covered with very dense white down beneath, which is so closely matted that it can scarcely be rubbed off the surface of the leaf. This fine down also covers the twigs, as well as the flowering stalks, which appear at the ends of the branches, where the small violet flowers are borne in narrow, erect clusters. The petals are joined at their base to form a narrow tube, but are separate above the throat of the tube, where they form five small lobes, of which the lower is by far the largest. Four stamens are exserted beyond the mouth of the tube. The small, fleshy, black fruit is



*VITEX NEGUNDO*

egg-shaped and encloses a four-chambered stone containing four seeds. The whole plant is strongly scented with a rank aromatic smell reminiscent of some members of the family *Labiatae*.

The wood is greyish-white and hard, weighing about 42 lb. per cubic foot. It is used for building purposes, and the branches for wattle-work. The ashes of the plant are used as an alkali in dyeing. The leaves are laid over stored grain to keep off insects.

The roots are employed as a tonic and febrifuge, and the leaves for a number of medicinal purposes, principally as a poultice for swollen joints and to cure headache. A decoction of the leaves is given as a remedy for catarrh of the head and as an internal remedy for fever. In Mysore a vapour bath is prepared from the plant to cure fevers, colds, and rheumatic affections.

This plant is common throughout most of the hotter parts of India and Ceylon. It is not abundant in the neighbourhood of Calcutta, but may be found fairly often in thickets and shrubberies near villages, and is occasionally cultivated in gardens. A specimen may be seen (in 1943) on the west side of Camac Street.

The flowers appear chiefly in May or April, but also at other times of the year.

**Vitex trifolia** Linn. f.

(Trifolia is Latin meaning "with three leaflets.")

| | |
|---|---|
| Bengali, | *pani samalu, pani sanbhaki.* |
| Hindi, | *pani ka sanbhalu, sufed sanbhalu.* |
| English, | *Indian wild pepper.* |

(F.I. p. 481. F.B.I. Vol. IV. p. 583. B.P. Vol. II. p. 833.)

A shrub or small tree; leaves opposite, simple or 3-foliolate; leaflets sessile, obovate or obovate-oblong, subobtuse, entire, 1 to 3 inches long, glabrate above, white-tomentose beneath; petiole about 1 inch long; panicles 1 to 4 inches long, oblong, terminal, often leafy at the base; calyx 1/8 to 1/6 inch long, minutely 5-toothed; corolla 1/3 to ½ inch long, lavender to blue, tomentose, lobes 5, the anterior much the largest; stamens 4, exserted, filaments hairy at the base; drupe 1/5 inch diam., black, globose or ovoid.

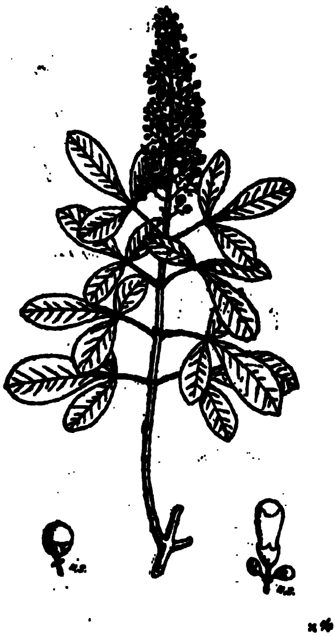
This is a shrub or small tree very similar in most respects to *V. Negundo* (see above), but differing in the shape of its leaflets, which are comparatively broad and have blunt ends, whereas those of *V. Negundo* are always finely pointed. Each leaf is usually divided into three leaflets, but occasionally only one leaflet is found.

The flowers and fruits are very like those of *V. Negundo*, but the flowers of *V. trifolia* are usually slightly larger and grow in rather smaller and less tapering clusters. As in the case of *V. Negundo* the lower surfaces of the leaves and the smaller branchlets are covered with fine white down, and the whole plant is rankly aromatic.

Medicinally this plant seems to be used for much the same purposes as *V. Negundo*, with which it is often confused. The root and seeds are said to yield a useful oil.

This species is widely scattered throughout India and East Asia but is nowhere common. It is occasionally found in thickets and village shrubberies near Calcutta.

The flowers are produced in the hot season.



*VITEX TRIFOLIA*

**CITHAREXYLUM.** (From the Greek "kithara", a lyre, and "xulon", wood, from the use of the wood to make musical instruments). A genus of about 20 species of trees and shrubs, natives of Central and South America. The small flowers grow in spike-like clusters. The calyx has 5 teeth or lobes, and the petals are joined to form a cylindrical tube with 5 lobes, which encloses the 4 stamens. The fruit is a fleshy berry partly enclosed in the enlarged calyx, containing 2 stones each holding 2 seeds.

In addition to the small tree described below, one or two other species of shrubs or small trees, with very similar leaves and flowers, are occasionally found in Indian gardens.

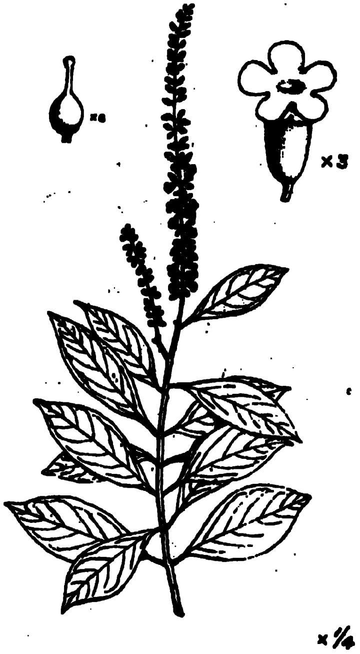
**Citharexylum quadrangulare** Jacq. *Syn.* C. spinosum Linn.
(Quadrangulare means "square", in allusion to the shape of the young stems. Spinosum is Latin meaning "thorny".)

English, *zither-wood.*

(Not in F.I., F.B.I., and B.P.)

A small tree; branchlets 4-angled; leaves opposite, elliptic-oblong, glabrous, nearly entire, margins recurved, up to 7 inches long; petiole ½ to 1 inch long; flowers scented, white, in pendulous spikes 4 to 15 inches long; calyx nearly truncate; corolla-tube ⅜ inch long; lobes 5, spreading; fruit a small fleshy drupe, seated on the cup-shaped calyx, red when ripe.

This low tree has a fairly straight trunk covered with light grey bark, and wide-spreading, drooping branches. Its rather narrow, pointed leaves are borne on short stalks in opposite pairs. The small, white, fragrant flowers grow in long pendulous spikes, the blooms all turned outwards from the central stalk. The petals are joined to form a short tube with five spreading lobes at its mouth, and the four stamens are attached to the inside of the tube. The fruit is a small, red, fleshy berry partly enclosed in the cup-shaped calyx, which enlarges as the fruit ripens.



*CITHAREXYLUM QUADRANGULARE*

This graceful little tree is a native of the West Indies. It is occasionally grown in India, and specimens may be seen in the Eden Gardens.

The wood is strong, hard, and even-grained. In the tree's native country it is made into stringed musical instruments.

The flowers appear at the beginning of the rains. In shape and manner of growth they are reminiscent of the closely allied genus *Duranta*.

## LAURACEAE

A family of aromatic trees and shrubs. The evergreen leaves usually have unbroken (entire) edges, and are rarely set in opposite pairs. The small flowers are sometimes, but not always, unisexual, and the 2 sexes are often borne on separate trees (dioecious). There are usually 6 sepals in 2 whorls of 3, and no petals. The stamens generally number 9 or 12, arranged in whorls of 3. The fruit is a berry containing 1 seed.

The family consists of about 34 genera with over 900 species, all natives of warm countries. It takes its name from the genus *Laurus*, which includes *L. nobilis* Linn., the bay laurel of Europe, a small tree with stiff narrow leaves which are used in cooking. The members of this family are all referred to in English as "laurels", though the shrubs commonly known as "laurels" in England belong to another family.

*Persea gratissima* Gaertn., the Avocado pear, a tree occasionally grown in India, is a member of the *Lauraceae*. *Laurus nobilis* is also planted in Indian gardens, but does not succeed easily and is seldom seen in lower Bengal.

**LITSAEA** (A Japanese name). A genus of about 140 species of trees and shrubs, natives principally of tropical Asia, Australia and the Pacific Islands. The leaves are scattered along the twigs. The flowers are minute and unisexual, the 2 sexes being borne on separate trees, and are combined in groups of from 4 to 6 flowers inside cup-shaped structures, so that each group resembles a separate flower. The fruit is a fleshy berry. About 45 species are found in India, of which 2 are common near Calcutta.

**Litsaea chinensis** Lamk. *Syn.* L. sebifera *Pers.* Tetranthera laurifolia *Jacq.*

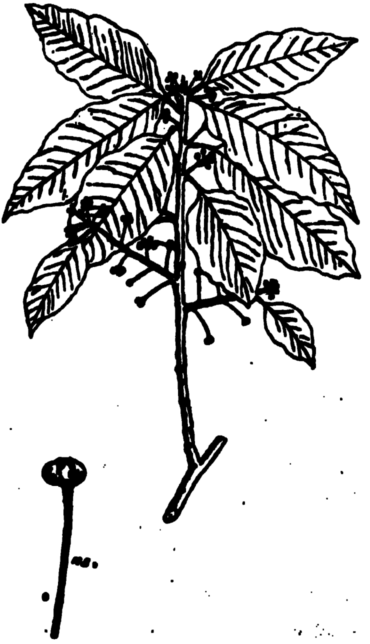
(Sebifera in Latin means "bearing tallow", in allusion to a vegetable wax that can be obtained from the fruit. Chinensis means "of China." Laurifolia means "with leaves like the laurel".)

| | |
|---|---|
| Bengali, | *kukur chita, garur, maidalakri, ratun.* |
| Hindi, | *maida, garbijaur, medh, menda, singrauf.* |
| Urdu, | *maidalakri.* |

(F.I. p. 735. F.B.I. Vol. V. p. 157. B.P. Vol. II. p. 902.)

Evergreen, very variable; branchlets, inflorescence, and undersides of leaves more or less pubescent; leaves ovate or elliptic-lanceolate, pale beneath, 5 to 10 inches long; petiole ½ to 2 inches; flowers dioecious, white or yellowish, forming capitate umbels on slender peduncles; heads ¼ inch diam. before opening, in axillary racemes or corymbs; bracts 4-6, concave orbicular; sepals 0; stamens 9-20 with long villous filaments; fruit ⅓ inch diam., globose, greenish or black.

This is a low, evergreen, aromatic tree or shrub with thick brown bark, and leaves that are very variable in shape but always more or less pale or silvery beneath and shining above. The minute flowers are combined in heads of from four to six flowers, each head closely resembling a single flower; they are unisexual and the two sexes are found on separate trees. When the flower-heads open they become quite conspicuous, especially those of the male trees which produce at the ends of the twigs numerous open clusters of flower-heads from which the yellowish hairy stamens project, the heads at this time



*LITSAEA CHINENSIS*

being about ⅓ inch in diameter. The fruit is a spherical berry, black when ripe.

An oil obtained from the fruit is used in China and Java to make candles. The root has been employed to yield fibre to be made into paper and string.

The wood is moderately hard, shining, and of a close and even grain. It seasons well, is durable, and is not attacked by insects. The weight is about 47 lb. per cubic foot.

The oil from the berries is used to cure rheumatism. The bark yields one of the best known of Indian drugs, which is considered a cure for diarrhoea and dysentery, and a good dressing for wounds, especially those made by venomous animals. The root also has a number of medicinal uses.

The tree is a native of all the hotter parts of India, Ceylon, Malaya, China, and Australia. It is common in thickets and village shrubberies in lower Bengal.

The flowers appear from May to September in periodical flushes. The new leaves are produced in April.

**Litsaea monopetala** (Roxb.) Narayanaswami. *Syn.* L. polyantha *Juss.* Tetranthera monopetala *Roxb.*

(Polyantha is from the Greek meaning "many flowered". Monopetala is also from the Greek meaning "with one petal", or "with the petals joined into one.")

| | |
|---|---|
| Bengali, | *bara kukur chita.* |
| Hindi, | *katmarra, singran, gwa, kakuri, kari, marda, meda, papria, randhari, karkawa, patoia.* |

(F.I. p. 735. F.B.I. Vol. V. p. 162. B.P. Vol. II. p. 903.)

Branches and leaves beneath tomentose; leaves very variable, usually elliptic-oblong, glabrous above, strongly reticulate beneath, 4 to 8 inches long; petiole ½ to 1 inch; flower-heads tomentose, 5- to 6- flowered, nearly sessile in small clusters, dioecious; sepals usually 5, linear-oblong; stamens 9 to 13, filaments hairy, reduced to staminodes in female flower; fruit ⅓ inch long, ovoid, black.

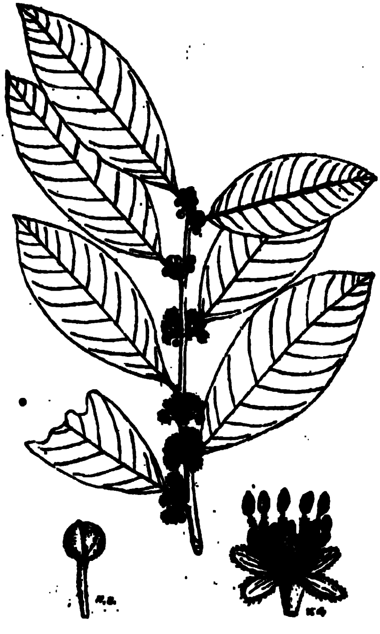
This is a small evergreen tree, or a large shrub, with the young twigs and the lower sides of the leaves covered with brown or rust-coloured down. The bark is dark grey in colour and smooth, but when old it peels off in corky flakes, and turns nearly black before peeling. Several minute, pale greenish-yellow flowers are combined to form one of many small heads, which closely resemble single flowers, are about 1/3 inch across when they open, and occur in compact clusters crowded along the smaller branchlets. The individual flowers are unisexual and the two sexes are found on separate trees. The fruit is egg-shaped and black when ripe. The leaves usually have a cinnamon-like smell when bruised, and though very variable in shape, are commonly pointed and rather narrow, and always have very prominent nerves on the lower surface.

The seeds yield an oil which is used to make candles and ointments. The bark is astringent and is considered a cure for diarrhoea. It is also employed as a stimulant, and after being pounded is often applied, fresh or dry, to bruises and contusions. The powdered roots are also applied to bruises.

The wood is soft and not durable, being soon attacked by insects. It weighs about 38 lb. per cubic foot. It is made into agricultural implements.

The leaves are used in Assam to feed silk-worms.

The tree is indigenous in most of the hotter parts of India, Burma, Java, and China, and is not uncommon in village shrubberies near Calcutta.



*LITSAEA MONOPETALA*

The flowers appear in February and during the hot weather, and the fruits ripen during the rains. The leaves are renewed in the hot season.

**CINNAMOMUM.** (An ancient Greek name, of Semitic origin). This is a genus of about 130 species of evergreen trees and shrubs, natives of the warm countries of Eastern Asia, Australia, and the Pacific, of which about 15 species are found in India. The leaves are often in opposite pairs, and usually have three longitudinal nerves converging at the base. The small flowers are bisexual, or unisexual, and are borne in large clusters near the ends of the branches. There are 6 sepals, 9 fertile stamens in whorls of 3, and 3 thick stamens without anthers (staminodes). The fruit is a berry containing one seed.

In addition to the two species described below, *Cinnamomum zeylanicum* Breyn., the cinnamon tree, is occasionally grown in Indian gardens, but in the climate of Bengal it seems to take the form of a dense bushy shrub, although in its native home it attains a considerable height. It differs from *Cinnamomum Tamala* chiefly by its very aromatic leaves, which smell strongly of cinnamon and are usually larger and more leathery than those of its commoner relative.

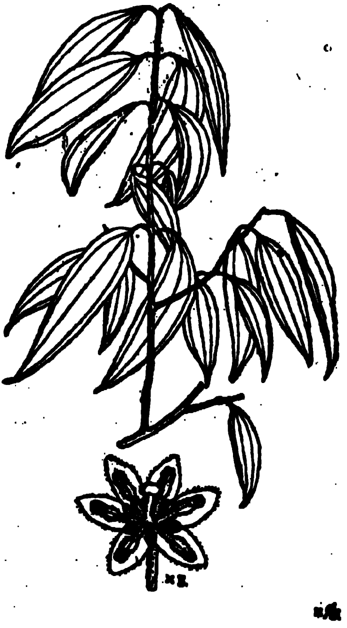
**Cinnamomum Tamala** Nees. *Syn.* Laurus Cassia *Roxb.*
(Tamala is an Indian vernacular name).

| | |
|---|---|
| Bengali, | *tejpat.* |
| Hindi, | *barahmi, dalchini, kikoa, silkanti, talispatri, tezpat, kirkiria, kikra.* |
| Urdu, | *tejapat.* |
| English, | *cassia cinnamon, cassia lignea.* |

(F.I. p. 337. F.B.I. Vol. V. p. 128. B.P. Vol. II. p. 899.)

Leaves opposite or subopposite, ovate, oblong, or lanceolate, usually acuminate, 3-nerved, usually 4 to 5 inches long, shining above; petiole ½ inch long; flowers in panicles scarcely exceeding the leaves; perianth ¼ inch long, silky; stamens and ovary villous; fruit ellipsoid, ½ inch long, fleshy, black.

This is a medium-sized evergreen tree with thin, brown, wrinkled bark. The leaves are set on short stalks in more or less opposite pairs; they are variable in size and shape, but are pointed and usually rather narrow. When mature they are always of a dark, shining green above, and paler below, and they have three prominent nerves springing from the base and curving outwards to meet again at the tip of the leaf. When young the leaves and twigs are of a beautiful pink colour. The small yellowish-white flowers grow in short open clusters from the axils of the leaves near the ends of the branches. The fruit is a black, fleshy berry containing a single stone.



*CINNAMOMUM TAMALA*

The leaves have a strong scent, and taste not unlike real cinnamon, and are much valued for flavouring curries and other dishes. They are also employed in the adulteration of true cinnamon, (which is the bark of *C. zeylanicum*). The bark is also used as a substitute for cinnamon, and large quantities are exported from China and elsewhere for this purpose. The immature fruits have also been exported under the name of "cassia buds" or "*flores cassiae*", and were formerly employed for the same purposes as the bark, and in the preparation of spiced wine.

The leaves and bark are used in tanning skins and an oil obtained from the bark has been utilised in the manufacture of soap.

The wood is fairly hard and close-grained, but is inclined to split and warp, and is little used. It is reddish-grey in colour and slightly scented, its weight being about 40 lb. per cubic foot.

Medicinally the bark and leaves are prescribed for the same purposes as real cinnamon ; in particular they are given internally to relieve colic and indigestion.

The tree is a native of the Himalayas, Assam, and Burma. It is commonly grown in gardens in North India, and is often found near villages in the neighbourhood of Calcutta. The flowers appear in the cold season.

**Cinnamomum Camphora** F. Nees. *Syn.* Camphora officinarum *Nees.* (Camphora is from the Arabic name. Officinarum is Latin meaning "of the workshops, or factories", i.e. "used in industry.")

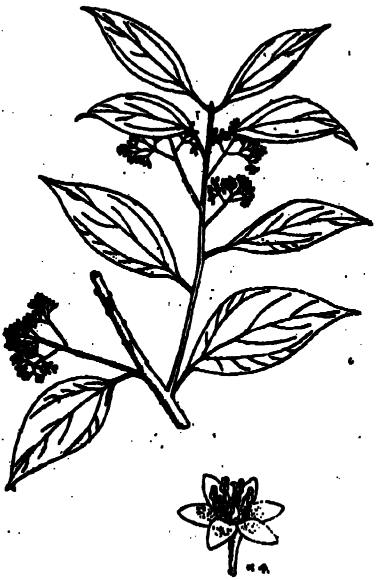
| | |
|---|---|
| Hindi, | *kaphur.* |
| English, | *camphor, camphor laurel, Japan camphor tree.* |

(Not in F.I. F.B.I. Vol. V. p. 134. B.P. Vol. II. p. 899.)

Glabrous ; leaves alternate, ovate, oblong, lanceolate or elliptic, acuminate, acute at both ends, penninerved, about 3 inches long ; petiole 1 inch ; buds scaly ; flowers small, yellow, in axillary panicles shorter than the leaves ; yellow glands on the inner stamens conspicuous ; perianth membranaceous ; fruit a drupe, ⅓ inch diam., subglobose, black.

The camphor tree grows to a moderate size, having a short trunk branching not far from the ground, and rough dark brownish-grey bark. Its foliage is dense, sombre and evergreen. The leaves are small and shining, very dark green above but paler below with a waxy coating, and are closely set along the many small twigs on rather long stalks ; they have a pleasant aromatic scent when crushed. The minute, yellow, sweet-scented flowers grow in short open clusters from the axils of the leaves, and are followed by small berries each containing a single seed.

This is the tree which yields the real "Japan camphor" as distinct from " Malay " or " Borneo " camphor, which is obtained from *Dryobalanops Camphora*, a tree of the *Dipterocarpus* family. The camphor is obtained by boiling the leaves, and chips of the wood and roots. This trade is very important in Japan, and large quantities of camphor are exported for use in medicine, to preserve articles from insects, and in various manufactures. Although the tree grows well in India, no attempt seems to have been made to produce camphor in this country.



*CINNAMOMUM CAMPHORA*

Medicinally various parts of the tree are given internally to cure colds and chills. Externally it is used to relieve inflammations, bruises and sprains.

The wood is greyish-white, fairly hard, and strongly scented with camphor. The weight is about 39 lb. per cubic foot.

The tree is a native of China and Japan. It is not uncommonly planted in Indian gardens, where it makes a very dense evergreen shade-tree of handsome but rather gloomy aspect. A fine specimen grows in the Royal Agri-Horticultural Gardens in Alipore (1941).

## PROTEACEAE

A family containing about 50 genera with 960 species of trees and shrubs, natives of Australia and other countries where there is annually a long period of drought, which the plants are well adapted to resist. The flowers have 4 sepals that are joined into a tube at their base but are separate above and are generally rolled back when the flower is open, and the style usually projects beyond them. The flowers are in heads and clusters, and are often showy. The fruits take various forms. No species of this family is indigenous in India, but several are occasionally grown in gardens. One only is commonly found near Calcutta.

**GREVILLEA.** (Named after C. F. Greville, once Vice-President of the Royal Society, and a patron of botany). A genus of about 160 trees and shrubs, natives of Australia. The leaves vary greatly in appearance. The small flowers are arranged in pairs, which form large clusters. The style projects in a long loop, and at first the stigma is held back near the 4 stamens, where pollen is shed upon it. Then the style straightens out, and the pollen may thereafter be carried away by insects, thereby permitting cross-pollination by pollen from another tree. The stigma does not become receptive till later, when any pollen that has not yet been removed fertilises the stigma of its own flower. The sepals number 4, and are usually bent or rolled back when open. The fruit is a follicle (i.e. a dry pod opening by one suture) containing 1 or 2 winged seeds. Several species of this genus are occasionally grown in India.

**Grevillea robusta** A. Cunningham.

(Robusta in Latin means "strong", or "big".)

English, *silky oak, silver oak.*

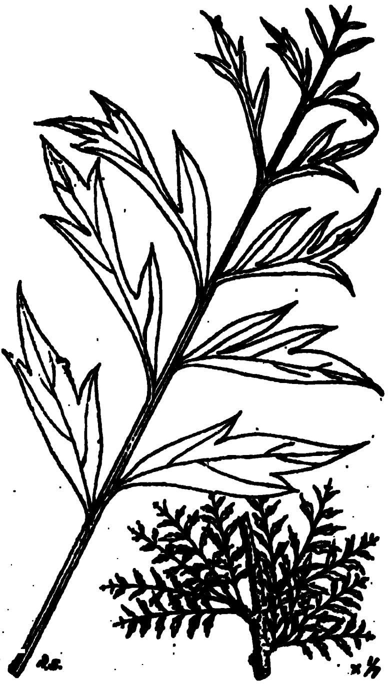
(Not in F.I., F.B.I., and B.P.)

A large tree; leaves pinnate, silvery below; leaflets 4 to 12 inches long, deeply pinnatifid (leaves almost bipinnate); flowers orange, glabrous, in one-sided racemes 3 to 4 inches long fascicled on short leafless branches; perianth-lobes 4, reflexed; stamens 4; follicle oblong, compressed, oblique, ¾ inch long by 2/5 inch wide; seeds winged.

This is a tall, narrow, graceful tree with rough bark, short branches, and deeply divided fern-like leaves, which are dark green above, and more or less silvery below. The flowers seldom appear in Calcutta, but occasionally almost cover the branches with reddish-orange flowers, borne in dense clusters on short branchlets. There are four petals, which are bent back when the flower opens, and four stamens, which project beyond the petals together with the style. The young shoots are covered with rust-coloured down.

The wood is hard and very prettily marked, and is much used for furniture etc. in Australia. It weighs about 40 lb. per cubic foot.

The tree is a native of Australia. It is now widely cultivated in the tropics, and is much grown in South India and Ceylon as a wind-break and shade-tree. In the U.S.A. it is often grown as a pot plant. It is not uncommon in Calcutta



*GREVILLEA ROBUSTA*

parks and gardens, and may easily be recognised by its slender shape and handsome foliage. The flowers appear in the hot season. In Bengal the trees live only about 25 years, after which the trunks usually rot and break.

## EUPHORBIACEAE

This is an important family of trees, shrubs and herbs, with very various appearance and habit, often with milky sap. The leaves are usually not arranged in opposite pairs. The flowers are generally small, often have no petals, and are nearly always unisexual. The ovary is not joined to the calyx, and usually consists of three divisions (carpels) which form a fruit with 3 or 6 lobes. The flowers are sometimes united in heads, each of which resembles a single bisexual flower. The family is very widely represented in the tropics. It contains in all over 200 genera with about 4,000 species distributed everywhere except in the arctic regions.

The family includes the genus *Codiaeum*, to which belong the so-called "crotons" of Indian gardens. These are varieties of *Codiaeum variegatum* Bl. (see under the description of the genus *Croton* below).

Also included in this family is the genus *Mallotus*, to which belongs *M. philippinensis* Muell. (Bengali, *kamala*), a low evergreen tree having small trilobed fruits covered with a red powder, which is used as a dye for silk; it may possibly be found planted near Calcutta though it is a native of dryer parts of India. *M. repandus* Muell. (Bengali, *akus*, or *nun bhantur*) is a large climbing shrub common in thickets to the north of Calcutta; it has very broad leaves covered beneath with fine yellowish down and set on slender stalks in opposite pairs. The young stems, the flowers, and the fruits are also covered with yellowish hairs.

**EUPHORBIA.** (A classical name, said by Pliny to be in honour of a physician of King Juba of Mauritania). A genus of about 600 species consisting mostly of herbs but including a few soft-wooded trees, with fleshy green branches, which sometimes bear a very strong superficial resemblance to some members of the *Cactus* family. The soft stems are full of milky juice. The minute flowers are combined in heads each usually comprising one central female flower and 10 to 15 male flowers each consisting of a single stamen and surrounding the female flower; these are all enclosed in a cup-shaped structure (or involucre) like a calyx, so that the whole closely resembles a single bisexual flower. Within the involucre but outside the male flowers are usually several separate yellow glands.

The genus includes the well-known *E. pulcherrima* Willd. the poinsettia, a tall shrub cultivated for the bright red bracts that surround its flower-heads; and also a large number of herbs (spurges), common in temperate as well as tropical climates, of which 3 species are abundant weeds of paths and waste-places in Bengal, and are known in Bengali as *herui*.

**Euphorbia Tirucalli** Linn.

(Tirucalli is a Malayalam name).

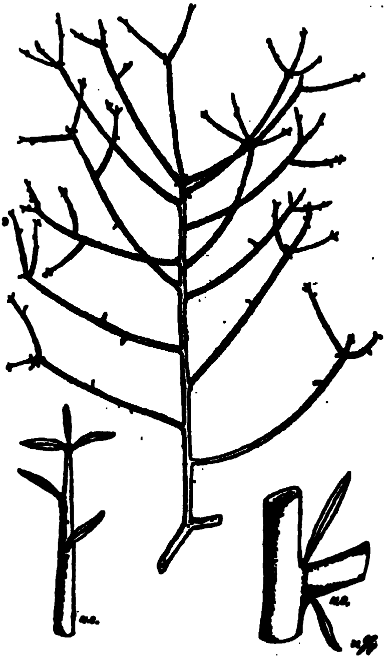
| | |
|---|---|
| Bengali, | *lankasij, latadaona.* |
| Hindi, | *sehnd, sehud, shirthohar, thohṛa, konpahl-sehnd.* |
| Urdu, | *zakum*, (This name is given to several other species also). |
| English, | *milk bush, milk hedge, Indian tree-spurge.* |

(F.I. p. 393. F.B.I. Vol. V. p. 254. B.P. Vol. II. p. 924.)

Unarmed; branches spreading, cylindric, scattered, whorled or clustered, smooth, slender, up to ⅓ inch thick, green; leaves linear-oblong, up to ⅓ inch long, caducous, or wanting; involucres shortly pedicelled, 1/12 inch long, crowded at the ends and in the forks of branches; capsules 3-lobed, villous, dark brown, ¼ inch long; seeds ovoid, smooth.

This is a bushy shrub, or sometimes a small tree, its trunk (when present) covered with rather rough greenish-brown bark having a cracked appearance. Its many slender, smooth, green, thornless twigs resemble stout rushes, and the leaves, when not altogether wanting, are very small, and soon fall to the ground. The minute flowers grow in dense clusters at the ends of the branches and in their forks. The fruit is dark brown and velvety, with three deep lobes.

The milky juice, of which the whole plant is full, causes great pain if it gets into a cut in the skin or into the eye, and it is said to be used criminally to destroy the eyes of domesticated animals. It is employed medicinally for a wide variety of purposes, but particularly as a cure for warts, rheumatism and neuralgia. Rubber can be obtained from the juice, and has been extracted from the plant on a commercial scale in Nepal.



EUPHORBIA TIRUCALLI

The ashes of the plant, after burning, are used as an ingredient of a red dye. The wood of the trunk is white, close-grained, and fairly hard, weighing about 34 lb. per cubic foot. It is used for rafters and similar purposes, and is said to give excellent charcoal, especially for making gunpowder.

This plant is a native of Africa but is now widely grown in India, Burma, and Ceylon, though not commonly in lower Bengal. It may be found in gardens and villages near Calcutta, where it is sometimes used to form hedges, but it is rarely seen in the form of a tree. The flowers appear during the rains.

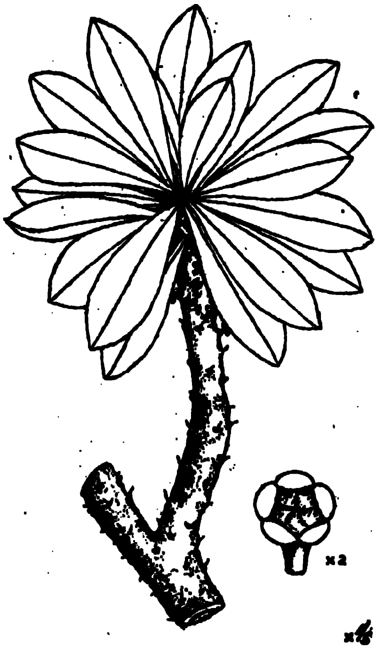
**Euphorbia Nivulia** Linn. *Syn.* E. neriifolia *Roxb.*

| | |
|---|---|
| Bengali, | *sij.* |
| Hindi, | *katathohar, senhur, sij, thor, thuhar, thura.* |
| Urdu, | *zakum.* (This name is applied to other species also). |

(F.I. p. 392. F.B.I. Vol. V. p. 255. B.P. Vol. II. p. 923.)

Branches spreading, often whorled, jointed, terete, often armed with pairs of spines inserted on flat corky-areas ; leaves fleshy, sessile, obtuse, cuneate or obovate, 4 to 12 inches long, deciduous ; involucres yellow, usually 3, in short cymes near the ends of the branches, the 2 lateral female, the central male ; anthers purple ; capsule prominently 3-lobed, lobes compressed.

This is a shrub or a small bushy tree up to 30 feet high, with round green branches having no ribs or angles, and, in the case of old plants, a thick corky bark on the trunk. Often the branches are armed with spines set in pairs on flat, brown or blackish, corky areas (not on swellings or nodes) ; and the smaller branches usually grow in whorls, several springing from the same level on the larger stem. The leaves grow near the ends of the branchlets. They are fleshy and smooth, have no stalks, and are generally broadest near the apex. In the cold weather they usually fall, and the tree remains leafless till fresh leaves appear in the hot weather, or during the rains. The small yellowish flowers grow near the ends of the branches on short stalks, three flowers being usually grouped together, the central being male, and the outer female. The small fruit has three pronounced lobes.



EUPHORBIA NIVULIA

This plant is often grown as a hedge, and occasionally develops into a small tree with a straight trunk and a dense bushy crown. It is a native of the dry and rocky parts of India, but is often planted in Bengal villages. The flowers are seldom produced in the damp climate of Calcutta.

The juice of the leaves is used as a purgative, and as a cure for rheumatism and earache. The pulp of the stem, mixed with green ginger, is given to people bitten by mad dogs.

This plant closely resembles *Euphorbia neriifolia* but may be distinguished by its spines, when present, being borne on flat corky patches, not on raised knobs or swellings. The stems of *E. neriifolia* always have spines borne in pairs on swollen nodes, which are arranged in five lines.

**Euphorbia neriifolia** Linn. *Syn.* E. ligularia *Roxb.*

(Neriifolia means "with leaves like *Nerium*, or oleander", but the supposed resemblance is by no means obvious).

| | |
|---|---|
| Bengali, | *mansa sij, hijdaona, patasij.* |
| Hindi, | *patton kisend, sehund, sij, thohar.* |
| Urdu, | *zakum.* (This name is also given to other species.) |

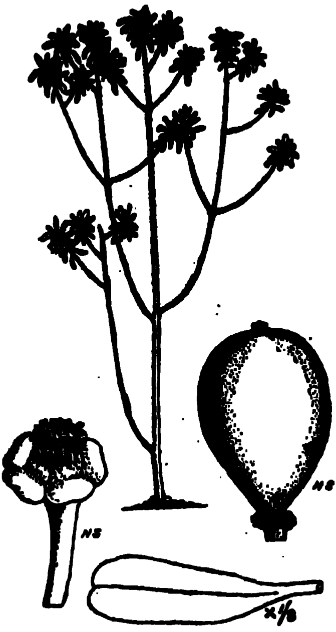
(F.I. p. 392. F.B.I. Vol. V. p. 255. B.P. Vol. II. p. 923.)

A shrub or small tree ; stem and branches slightly 5-gonous in section, with pairs of stipular spines on nodes which are arranged in 5 vertical or spiral rows ; leaves few, fleshy, sessile, obovate or oblanceolate, 6 to 12 inches long ; involucres reddish or yellowish, 3 to 7 in compact, shortly pedunculate, dichotomous cymes about 3 inches long, from the sinus between the nodes ; style 3-fid ; capsule prominently 3-lobed.

This is a small erect tree or shrub, with smooth and hairless, fleshy, cylindrical stems, the main trunk being covered with reticulated bark. Its branches are marked with small nodes or swellings, arranged in spiral fashion, from each of which a pair of spines usually projects. The smaller branchlets are green, and sometimes appear twisted owing to the nodes, from which the leaves and thorns spring, being spirally arranged and causing the branchlets to have five angles or ridges which rotate in a more or less spiral manner. The leaves are few and are mostly borne near the ends of the branchlets ; they are broadest near the apex and taper towards the base, but usually have a small point at the tip ; their texture is smooth and fleshy, and they have no stalks. Near the ends of the branchlets the small yellowish flowers grow in numerous clusters, each cluster springing from a space between two nodes and containing only a few heads of flowers, which are of two kinds, male and bisexual. The fruit is small with three pronounced lobes, each containing a single seed.

This plant is common in the dry parts of India and Burma, where it is found on waste land near villages, and is often grown to form hedges. In Bengal it is occasionally used for hedging purposes, but is more commonly planted for religious reasons near temples and Hindu houses, when it grows into the form of a tree.

The tree is sacred to Manasa, the goddess of serpents, and is said to be planted on the fifth day after full moon of the month of Sravana, and venerated as the representative of the goddess.



EUPHORBIA NERIIFOLIA

It is said that if the branches of this plant are broken a poisonous vapour is given off. The late G. M. Woodrow, Professor of Botany at the College of Science in Poona, records in his book "Gardening in the Tropics" that as a result of investigating the truth of this belief he once spent three days in hospital. The subject seems to merit further experiment.

The milky juice is extremely copious, and is used for various medicinal purposes. It is a drastic purgative, and is considered a valuable cure for earache. Mixed with soot it is applied to the eyes for ophthalmia, and mixed with syrup it is given to cure asthma and bronchitis. It is also used as a remedy for warts, and is commonly believed to be an antidote to snake-bite and hydrophobia.

The wood of the trunk is white, soft, and even-grained. It weighs only about 26 lb. per cubic foot.

This plant is not easy to distinguish from *Euphorbia Nivulia*, but may be known from its thorns which grow on warty knobs, or projections from the stem. In the case of *E. Nivulia*, the thorns, when present, are borne on flat corky patches.

The flowers appear in the hot weather.

**Euphorbia Antiquorum** Linn.

(Antiquorum in Latin means "of the ancient writers".)

| | |
|---|---|
| Bengali, | *Bajvaran, tikata sij, shibgach.* |
| Hindi, | *tindhára sehund* |
| Urdu, | *zakum.* (This name is applied to other species also.) |

(F.I. p. 392. F.B.I. Vol. V. p. 255. B.P. Vol. II. p. 923.)

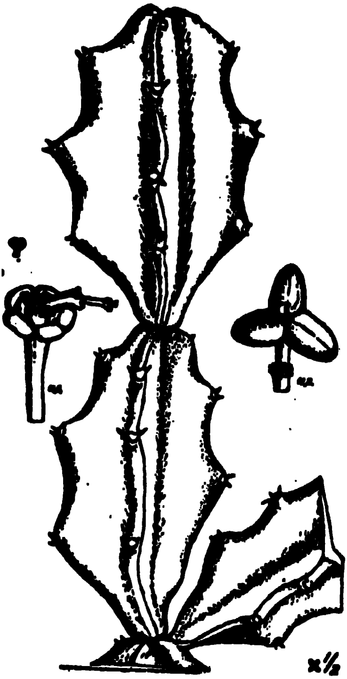
A small tree or shrub; branches stout, jointed, spinous, 3- or 5-angled, 3 to 6 inches broad, with undulating ridges; leaves small, caducous;

involucres in lax cymes, nearly ½ inch broad, yellowish; styles free, 2-lobed; cocci compressed.

This is a very variable fleshy tree or shrub, with soft, thorny branches, which are jointed, angled, and more or less distorted, the thorns being borne on the three or five sharp angles that are present on every branch. The leaves are small and fall early, so that they are often altogether absent. The pale yellow flowering heads are borne close to the ends of the branches. Apart from the flowers the general look of the plant is strongly reminiscent of some species of *Cactus*.

This plant is frequently used for making hedges, for which purpose it is very well adapted owing to its quick growth and formidable thorns. It is also grown as an ornament or a curiosity in gardens.

Many valuable medicinal properties are attributed to the plant, the bark, juice and root, all being used to cure a wide variety of diseases. In particular the root and juice are used as purgatives, and the juice is prescribed for rheumatism, tooth-ache, warts, and nervous diseases. It is also used to poison fish, and to kill maggots in wounds.



*EUPHORBIA ANTIQUORUM*

In some parts of India the plant is believed to ward off lightning, and for this reason is grown in pots and tubs on the roofs of houses. In Assam and the Terai it is cultivated as a sacred tree.

The plant is indigenous in all the hotter parts of India and Ceylon in fairly dry places. It is common on the north of Calcutta, but is rarely seen on the south, probably owing to the low-lying nature of the ground on that side of the city.

The flowers appear from January to March, and the leaves during the rains.

**JATROPHA.** (From Greek 'iatros", a physician, and "trophe", food, in allusion to the medicinal qualities of the plants). A genus of about 70 species of herbs, shrubs, and trees, chiefly American. The plants are often covered with glands or prickles, and the leaves are often lobed. The genus is exceptional for its family in that the flowers usually have petals, and are sometimes comparatively large and showy. The flowers are borne in small clusters and are unisexual, but the two sexes are found on the same tree (monoecious). The male flowers have many stamens, and the fruit is a dry capsule. About seven species are found in India, but only one worthy of being called a tree is found near Calcutta. In addition *Jatropha multifida* Linn., the coral plant, a large soft-wooded shrub with round, deeply divided leaves and scarlet flowers, is sometimes seen in Bengal gardens; and several other shrubs of this genus are found cultivated or wild in Bengal.

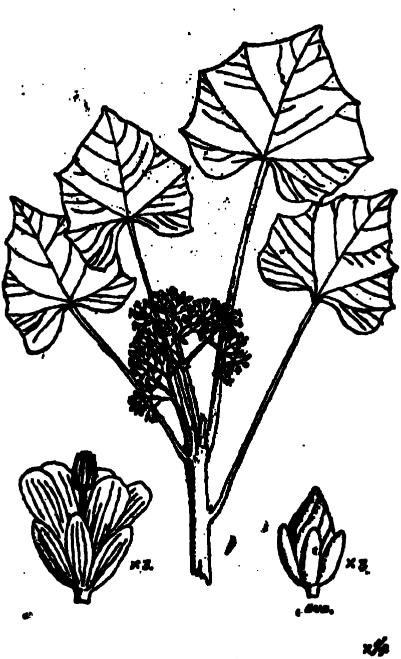
**Jatropha Curcas** Linn.

(Curcas is an ancient Latin plant name).

| | |
|---|---|
| Bengali, | *bagh bherenda, bon bheranda.* |
| Hindi, | *bagh bherenda, safed ind, jangli arandi.* |
| English, | *Barbados nut, physic nut, poison nut, purging nut.* |

(F. I. p. 689., F.B.I. Vol. V, p. 338. B.P. Vol. II. p. 941.)

A soft-wooded shrub, or small tree; young shoots often pubescent, otherwise glabrous; leaves angular or 3- to 5-lobed, 4 to 6 inches long; petiole at least as long as the blade; flowers in peduncled cymes, greenish yellow, ½ inch diam., monoecious; sepals 5; petals 5, stamens 10, biseriate; ovary and styles glabrous; capsule 1 to 1½ inches long, ovoid.



*JATROPHA CURCAS*

This is an evergreen, soft-wooded shrub, or small tree, with smooth greenish bark. It leaves are more or less round with from 3 to 5 angles or lobes, and are set on long stalks. The unisexual, greenish-yellow flowers are borne in small stalked clusters among the leaves at the ends of the branches. Each flower has five sepals, five petals, and either ten stamens in two whorls of five, or three forked styles surmounting the ovary. Male and female flowers are found on the same tree. The fruit is egg-shaped, and black when ripe.

The plant is readily propagated by cuttings and is much used in Bengal to form hedges. It is often to be found serving this purpose in the neighbourhood of villages, and is the more suitable for this because it is not eaten by either goats or cattle.

The seeds, leaves and juice are considered to have a variety of medicinal properties. The seeds in particular are often used as a purgative, but they are sometimes found to be uncertain and poisonous in their action. The sap is prescribed for tooth-ache and to stop bleeding, but is said to be blinding if applied to the eyes. Both the sap and the pounded leaves are used as a dressing for wounds.

The twigs are much employed as tooth-brushes. The juice and bark yield a black or dark blue dye. The seeds give an oil which is sometimes burnt by the poor for illuminating purposes, and has also been put to various commercial uses, particularly for making soap and candles, under the name of "jatropha oil". The Chinese are said to make a varnish by boiling the oil with iron oxide.

The milky juice of the stems is elastic and children sometimes blow bubbles with it from the end of a straw.

The plant is distributed widely throughout the tropics, and is common near Calcutta.

The flowers appear from March to May, and the leaves fall during the cold season.

**CROTON.** (From the Greek "kroton", a tick, in allusion to the appearance of the seeds). A genus of over 500 species of trees and shrubs, distributed in all hot countries. The flowers are unisexual, both sexes being usually found on the same plant in spikes or narrow clusters at the ends of the branches. The stamens number from 10 to 30. The styles are divided into 2 parts, and the fruits contain one seed in each division, of which there are generally 3. Petals are usually present in the flowers.

More than a dozen species are found in India and 5 or 6 in Bengal. Among the latter is *Croton Tiglium* Linn. (Bengali, *jaya pala* or *jaipal*), the purging croton, a small evergreen tree closely resembling *Croton oblongifolius* (described below), but differing in having minute star-shaped hairs on its flowers and young shoots, instead of silvery scales, and in having from 3 to 5 nerves meeting at the base of each leaf instead of the single central nerve of *C. oblongifolius*: This tree is a native of Malaya, but is often cultivated in India and was said by Sir David Prain to be frequently planted near villages in the neighbourhood of Calcutta, though it now seems to be seldom, if ever, found in that vicinity. Its seeds yield an oil, which is much used as a purgative and is also employed as an external stimulant and rubefacient.

One of the commonest weeds of roadsides and waste places near Calcutta is *Croton sparsiflorus* Morung., a small shrub about 18 inches high, with tapering, toothed leaves, and minute flowers in spike-like clusters at the ends of the branches. The plant is a native of South America and has only been introduced into India during the last 50 years, but it is now widely spread throughout the country.

The so-called "crotons" of gardens do not belong to this genus but are varieties of *Codiaeum variegatum* Bl. The leaves of these shrubs show a wonderful diversity of colour and shape, which has made them very popular in gardens in all hot countries, especially India. They usually do not exceed 6 feet in height, but specimens may sometimes be found as much as 12 feet high. The genus *Codiaeum* differs from *Croton* principally in having undivided styles, whereas the latter genus has styles that are cleft into two parts.

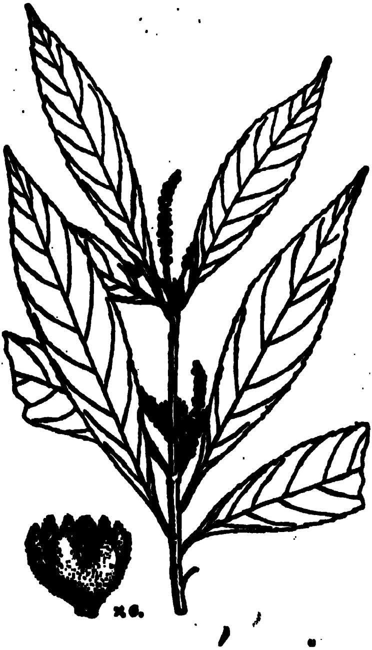
**Croton oblongifolius** Roxb.

(Oblongifolius is Latin meaning "with oblong leaves".)

| | |
|---|---|
| Bengali, | *chuka, putri.* |
| Hindi, | *arjunna.* |

(F. I. p. 688. F.B.I. Vol. V. p. 386. B.P. Vol. II. p. 943.)

A small deciduous tree; shoots, branchlets, young leaves and inflorescence covered with minute silvery scales; leaves coriaceous, alternate, crenate, oblong or elliptic, glabrous when mature, penninerved, up to 12 inches long, usually about 6 inches long; petiole 1 to 2 inches long; flowers usually monoecious, in terminal and axillary racemes up to 9 inches long, the female flowers below the male, protogynous; petals 5, woolly; stamens about 12; styles 3, long, bifid; capsule about ⅓ inch long, globose, covered with flat scales.



*CROTON OBLONGIFOLIUS*

This is a small spreading tree with smooth, brownish-grey bark and a short, erect trunk, often irregularly furrowed. The rather large, hairless leaves have toothed edges and are set on fairly short stalks near the ends of the branchlets, not arranged in opposite pairs. The small, greenish, unisexual flowers grow in long, narrow, spike-like clusters near the ends of the branchlets. Usually flowers of both sexes are found in the same cluster, the males near the apex, and the females below near the base of the cluster, but it is said that male and female flowers are sometimes found on separate trees. When they grow together, the female flowers wither and begin to form fruit before the male flowers open. The flowers of both sexes have five minute sepals, and five equally small, woolly petals, the male flowers having about a dozen yellowish stamens, and the female a hard ovary surmounted by three spreading, bifid styles. The fruit consists of an almost globular capsule containing three smooth brown seeds. The young shoots, young leaves, fruits, and most parts of the flowers are covered with minute silvery scales.

This tree is indigenous in most of the warmer parts of India, Burma, and Ceylon. Roxburgh recorded that it was common in the forests about Calcutta, but at the present time it seems to be scarce in that part of Bengal. Specimens may sometimes be seen in village shrubberies, and the plant is used in some places to make fences.

The fresh bark is pounded and applied to swellings, bruises, and sprains. The root-bark is used as a remedy for enlargement of the liver and in remittent fever. The fruits are purgative, and the seeds are sometimes used as a substitute for the well-known "croton oil" obtained from *Croton Tiglium*. Other parts of the plant are also prescribed as purgatives and as alteratives in dysentery. The oil from the seeds is sometimes used as an insecticide.

The wood is whitish or yellow, close-grained, fairly hard, and heavy. It cracks in seasoning and is of little value.

In the dryer parts of India the leaves turn orange or red before falling in March, and the fresh young foliage appears soon afterwards together with the flowers. In Bengal the leaves fall in February or earlier and do not give a very striking display of colour before falling, though the young leaves are bright green. The flowers usually appear in February and March, but sometimes at other times of the year.

**TREWIA.** (After C. J. Trew, a German physician, 1695-1769). A genus of 2 species of soft-wooded trees, natives of India and Malaya. The broad leaves are borne in opposite pairs. The flowers are rather large, without petals, and unisexual, the two sexes being borne on separate trees (dioecious). The male flowers have many stamens and 3 or 4 sepals; the female flowers are solitary and have slender styles. The fruit is a fleshy berry.

**Trewia nudiflora** Linn.

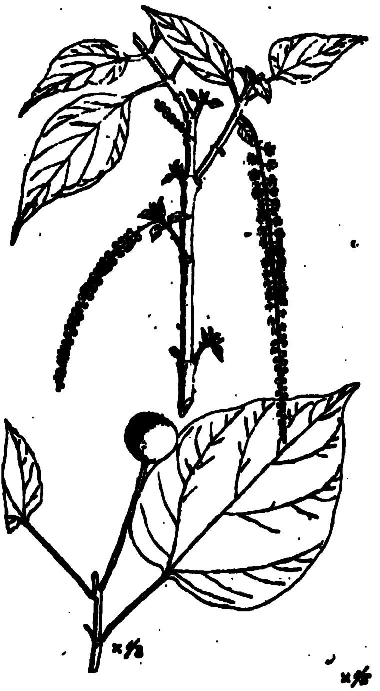
(Nudiflora in Latin means "with naked, or hairless flowers.")

| | |
|---|---|
| Bengali, | *pitali*. |
| Hindi, | *tumri, gamhar, khamara, bhillaura, pindara*. |

(F.I. p. 740. F.B.I. Vol. V. p. 423. B.P. Vol. II. p. 948).

A deciduous, dioecious tree, often tomentose or woolly; leaves opposite, broadly ovate or cordate, 4 to 6 inches long; petiole 1 to 3 inches; stipules minute and caducous but stipular lines present; male flowers ⅓ inch diam., in pendulous racemes up to 4 inches long; stamens yellow;

female flowers usually solitary, long peduncled; styles up to ¾ inch long; fruit globose, 1 to 1½ inches diam., pericarp thick; seeds 2 to 4, ovoid, contained in a crustaceous endocarp.



*TREWIA NUDIFLORA*

This tree does not usually grow to more than a moderate height in Bengal, though it attains a large size elsewhere. During most of the year it is rather inconspicuous, its shapeless habit of growth, and broad flabby leaves on rather long stalks, set in opposite pairs, not being attractive or distinctive. However the leaves fall in the cold weather, and at the end of December or in January the male trees become covered with catkin-like spikes of flowers consisting chiefly of masses of yellow stamens. Meanwhile the female trees produce only solitary green flowers, without petals, borne on long stalks, which subsequently develop into fairly large fleshy fruits containing a hard stone. The new leaves appear soon after or at the same time as the flowers. The bark is smooth and grey.

The fruits, which ripen from October to December, are said to be sweet and edible, but they do not seem to be much appreciated by Bengalis. Indian medical men believe this tree to have cooling and tonic properties, and the root is used to cure gout and rheumatism.

The wood is white and soft, weighing about 28 lb. per cubic foot. It is used for making drums and agricultural implements.

This tree is a native of all the hotter and damper parts of India. It is plentiful in the neighbourhood of Calcutta, being one of the commonest trees in thickets and jungles, and about villages, especially on the banks of canals and tanks.

When not in flower this species is very like *Gmelina arborea* Linn., but may be known by the raised line which connects the bases of each pair of opposite leaf-stalks, this line being absent in *Gmelina*.

**RICINUS.** (The classical name for the castor oil bean). A genus of one species, a soft-wooded tree or shrub with large lobed leaves. The unisexual petalless flowers grow in spike-like clusters at the top of the stem. The male flowers have many stamens joined together in several bundles.

**Ricinus communis** Linn.

(Communis in Latin means "common").

| | |
|---|---|
| Bengali, | *bherenda.* |
| Hindi, | *arand, arandi, erand, ind, rand.* |
| Urdu, | *eranda.* |
| English, | *castor oil plant, palma christi.* |

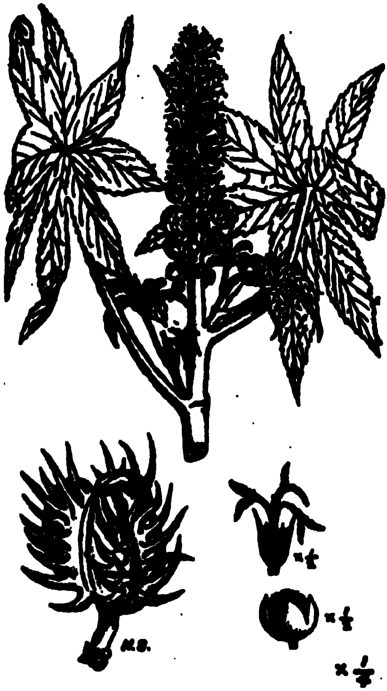
(F.I. p. 690. F.B.I. Vol. V. p. 457. B.P. Vol. II. p. 952).

A tall, evergreen, glabrous shrub, or small tree; leaves peltate, deeply palmately lobed, 1 to 2 feet diam.; petioles 4 inches to 12 inches long; flowers monoecious, in terminal racemes, apetalous; males usually above the females, ½ inch diam., calyx splitting into 3-5 valvate segments, stamens very many, connate in several branched columns; females usually below males, calyx spathaceous, caducous, styles often red or yellow; capsule of 3 2-valved cocci, ½ to 1 inch long, globosely oblong, generally echinate.

The castor oil plant is a soft-wooded shrub or small tree, often grown as an annual, and sometimes with an unbranched stem. Its large, grey-green leaves usually spring from the top of the stem, and are more or less deeply lobed, the leaf-stalks being shorter than the leaves, and joined to the leaf near its centre. The flowers are unisexual and without petals, but are unusually large for their family; they are borne in long erect clusters at the ends of the stems above the leaves, and are sometimes brightly coloured, though often greenish. The male flowers, which are crowded in the upper parts of the clusters, have numerous stamens joined into several branched columns; the females, which are bigger and are borne below the males, consist largely of three spreading styles, usually forked and often divided in a feathery manner. Usually the fruit is covered with soft, curved prickles.

This plant has a large number of economic uses, of which the most important is the yielding of castor oil, which is used all over the world as a purgative, and also for a wide variety of other purposes including lubrication and burning. Apart from its medicinal uses, it is still an important article of commerce, though it has now been largely superseded by petroleum products. The oil is also utilised for making soap, candles, hair-oil, and perfumery. The "cake" which consists of the residue after the oil has been extracted from the seed, is valued as a manure, and sometimes for feeding animals, though it is considered in Europe to be injurious to cattle.

In addition to the well-known properties of the oil, the plant has many other medicinal uses. The leaf is commonly prescribed for headache, as a poultice for boils, and sometimes as a febrifuge, and as a cure for rheumatism. A fomentation of the leaves is also applied to wounds. Various parts of the tree are employed to relieve toothache. The oil is said to be poisonous to flies.



*RICINUS COMMUNIS*

Cows are fond of the leaves of this tree, which are regarded as tending to increase the flow of milk. The dry stems, and the husks that remain after the extraction of the seeds, form a useful fuel. The timber is very soft and weak, but after drying is used in building walls of huts. It is sometimes said that the stems are not subject to the attacks of white-ants, but this statement is disputed. The leaves are a valuable food for a kind of silkworm, known as *eri* (*Attacus ricini* Boisd.) and the plant is much cultivated in Assam for this purpose.

The tree is probably indigenous in Africa. It is now planted throughout India and is common near villages in Bengal, though nowhere grown on a large scale in the province. A large number of varieties are known, which differ widely in the size and shape of the fruit and the colour of the flowers. The two principal forms are:—(1) a perennial, woody plant with large fruits and large red seeds, which yield an oil chiefly used for lubricating and illumination; and (2) an annual plant growing from 6 to 12 feet high, often cultivated as a field crop, with small grey and brown mottled seeds yielding oil of better quality used for medicinal purposes. The seeds of the latter variety are usually sown from May to July, and the fruits ripen in the following cold weather.

Several varieties with coloured flowers and foliage are grown in gardens; the best of these is perhaps *var. Gibsonii* with large purple-bronze leaves.

**GELONIUM.** (Possibly from the Greek "gelon", meaning "laughter"). A genus of evergreen, resinous trees and shrubs, consisting of about 15 species, natives of tropical Asia and Africa, of which 3 species are found in India, but only 1 in Bengal. The genus is distinguished by having a smooth fruit containing 3 seeds, no petals, and the sepals of the male flowers overlapping one another in bud. The flowers are usually in clusters among the leaves, the two sexes being on separate trees (dioecious).

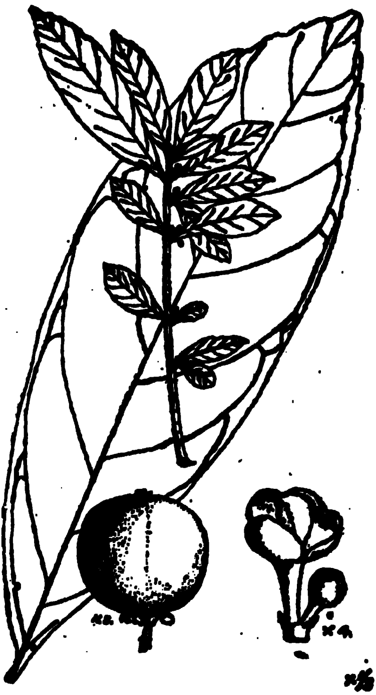
**Gelonium multiflorum** A. Juss. *Syn.* G. fasciculatum *Roxb.*

(Multiflorum in Latin means "many flowered". Fasciculatum is Latin meaning "closely clustered," in allusion to the flowers).

| | |
|---|---|
| Bengali, | *ban naranga.* |
| Hindi, | *ban naringa.* |

(F.I. p. 738. F.B.I. Vol. V. p. 945. B.P. Vol. II. p. 945).

A glabrous, dioecious tree; branchlets green, marked by stipular scars; leaves oblong or oblong-lanceolate, coriaceous, entire, 3 to 7 inches long; petiole very short; male flowers yellow, in axillary corymbs, or solitary, ⅓ inch diam.; stamens 40 to 60; fruit ⅓ to ¾ inch diam., 3-lobed, orange when ripe; seeds 3, embedded in white pulp.



GELONIUM MULTIFLORUM

This is a medium-sized tree, or sometimes a shrub, with smooth, shining leaves, and rather thick, greyish bark. The yellowish flowers are borne in clusters, or sometimes singly, along the branches from near the bases of the leaf-stalks. They are unisexual and the two sexes are borne on separate trees, the male flowers being fairly conspicuous when the tree is in full bloom, owing to the numerous yellow stamens and the large yellow base of the flower, which is covered with honey and very sweet scented. The female trees bear large numbers of more or less globular fruits, slightly lobed, which turn a bright orange colour when ripe. A yellow resin sometimes exudes from the buds. The leaves are rather narrow, bright green, and leathery in texture.

The wood is white, and only fit for rough structural purposes such as the posts used in the walls of huts.

The tree is a native of north-eastern tropical India, Burma and Malacca. It is common in thickets near Calcutta, and is occasionally planted in gardens for its nearly evergreen foliage.

The flowers are found from February to April, and sometimes again in October and November. In December the leaves or some of them, sometimes turn yellow or orange. The new leaves are mostly produced in February and March, and the fruits usually ripen in May.

**SAPIUM.** (The Latin name for a resiniferous tree). A genus of trees and shrubs with milky juice and alternate leaves (i.e. the leaves are not set in opposite pairs), and minute unisexual flowers in spikes at the ends of the branches, the males above and the females in the lower part of the spike. The flowers have no petals, and the two sexes are always borne on the same tree (monoecious). The male flower has 2 or 3 stamens, and the fruit contains 2 or 3 seeds. The genus comprises about 25 species, all natives of the tropics, of which about 6 are found in India, but only 1 near Calcutta.

**Sapium sebiferum** Roxb. *Syn.* Excaecaria sebifera *Muell. Arg.*
(Sebiferum in Latin means "tallow bearing").

| | |
|---|---|
| Bengali, | *mom china.* |
| Hindi, | *vilayati shisham.* |
| English, | *Chinese tallow tree..* |

(F. I. p. 691. F.B.I. Vol. V. p. 470. B.P. Vol. II. p. 954).

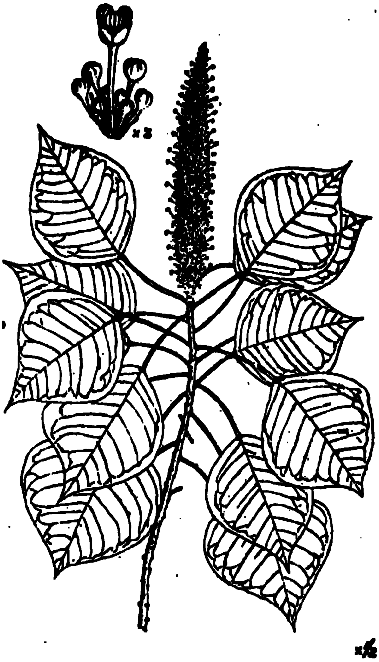
An evergreen glabrous tree; leaves broadly ovate, shortly acuminate, 1½ to 2 inches long, glaucous beneath; petiole slender, ½ to 1½ inches long, 2-glandular; racemes 2 to 4 inches long, male flowers above, clustered, 1/20 inch diam., pedicelled; anthers large, exserted; female flowers larger, and below the male; ovary narrowed into a short style with recurved stigmas; capsule coriaceous, subglobose, shortly pointed, ½ inch diam.; seeds 3.

This is a tree of moderate size, sometimes flowering as a low shrub, having rough, dark grey bark marked with shallow vertical cracks, and small but broad, shining, bright green leaves terminating in a pronounced point, or tail. At the ends of the twigs the minute flowers are clustered; the male flowers in pendulous, catkin-like spikes, and the females at the base of the male spikes; the first to open are males only, and the females mature later. The small green fruit contains three seeds embedded in a thick layer of a white fatty substance, which is sometimes extracted and is then known as " vegetable tallow "

In China the tallow from this tree is extensively used in place of animal tallow for the manufacture of soap and candles, and for dressing cloth. The tallow is separated from the seeds by steaming them over boiling water. However, the process of collection and extraction of the tallow has been found in India to be prohibitively expensive, and the tree is not now used commercially in this country.

The fruit can be made to yield an oil which can be burnt in lamps, but is inferior to cocoanut oil for this purpose. The acrid juice of the twigs is capable of raising blisters on the skin.

The wood is white, even-grained and fairly hard. It is used for making toys and furniture, and is suitable for printing-blocks. Its weight is 32 lb. to the cubic foot.



*SAPIUM SEBIFERUM*

The tree is a native of China, and is commonly found wild and cultivated in the north of India. It is plentiful near Calcutta, and is occasionally planted in gardens for its attractive foliage.

The flowers appear from April to June, and again in October and November. The young leaves at the ends of the branches sometimes turn a beautiful red or orange colour during the rains. New leaves appear at all seasons but the old leaves are all replaced by new about the month of February.

**EXCAECARIA.** (From the Latin "excaecare", to blind, in allusion to the blistering and blinding juice of some species). A genus of about 25 species of tropical trees and shrubs with acrid milky juice. The flowers are usually unisexual, and have 3 small sepals, but no petals. The male flowers have 3 separate stamens, and the female 3 stout styles. The fruit has 3 divisions (cells) each containing a single seed.

About 5 species of this genus are indigenous in India, but only 1 in Bengal. An exotic species, *E. bicolor* Hassk, is sometimes grown in Indian gardens for its handsome foliage. This is a small shrub with minute flowers and narrow, pointed leaves, which are deep, shining green above, and dark red beneath.

**Excaecaria Agallocha** Linn.

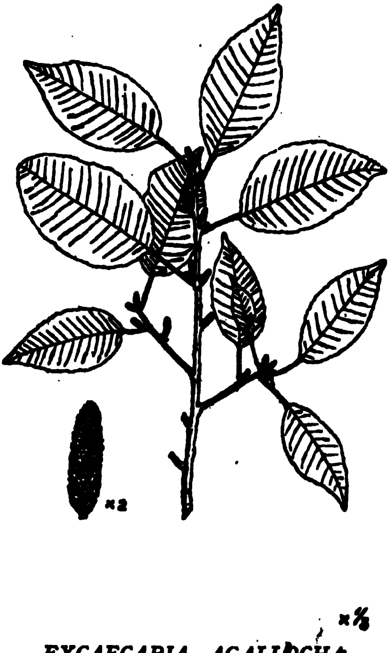
(Agallocha appears to be a corruption of a Malayan name "agila", which was applied to several trees which yield valuable timbers, also known as "eagle-wood", or "aloes-wood". This tree was for long erroneously supposed to be the source of that timber).

| | |
|---|---|
| Bengali, | *gengwa, geo, gheria, uguru.* |
| Hindi, | *gwa.* |
| English, | *blinding tree, river poison.* |

(F.I. p. 713. F.B.I. Vol. V. p. 472. B.P. Vol. II. p. 955).

A small, evergreen, dioecious tree with copious milky juice; leaves alternate, elliptic, usually very slightly crenate, acuminate, glabrous, bright green, blade 2 to 4 inches long, petiole about 1 inch; male flowers in axillary catkin-like spikes 1½ to 2½ inches long, each flower on a broad bract; stamens 3, exserted; female flowers in short racemes; sepals 3, broadly ovate, serrulate; fruit deeply 3-lobed, depressed, about ½ inch diam., coriaceous.

This is a small, bushy, evergreen tree or shrub, often branching from near the base, with fairly smooth, greyish bark, and bright green, shining foliage. The rather small, pointed leaves are set on fairly short stalks, mostly clustered near the ends of the numerous twigs; they are quite smooth and hairless, and at first sight appear to have unbroken margins, but on close examination it may be seen that they have minute notches widely spaced along their edges. The minute, fragrant, yellowish-green flowers are unisexual and the two sexes are found on separate trees (dioecious); the male flowers grow in long, catkin-like spikes, and the female in shorter clusters, each flower having a short stalk. The fruit is leathery, with three deep lobes, and a hollow opposite the stalk. The fruits and seeds vary very greatly in size.



EXCAECARIA AGALLOCHA

This plant is full of an excessively acrid milky juice, which gives rise to blisters and serious sores when applied to the skin, and is said to cause total blindness if it gets into the eyes, a disaster which occasionally happens to woodcutters.

The wood is very soft, light, and spongy. It is used for rough carpentry work, for making cheap furniture, and for charcoal and firewood, and in recent years for making paper. Its weight is only about 24 lb. per cubic foot. Fishing floats are said to be made from the roots.

In Fiji this plant used to be employed as a cure for leprosy. The unfortunate patient was first rubbed with the green leaves of the plant, bound hand and foot, and then suspended in the midst of poisonous smoke in a small room over a fire made from pieces of the wood. The result was the most horrible, protracted torture, and many died during the ordeal, but it is said that the treatment was often effective.

This tree is found on the banks of estuaries and in tidal forests near the shores of most parts of tropical Asia, and Australasia, wherever there is a plentiful supply of salt or brackish water. It is common in the Sunderbans and extends up the banks of the Hooghly above Diamond Harbour. A few specimens may be found within a few miles of Calcutta on the western borders of the Salt lakes, and for this reason the tree is entitled to a place in this book, although the other mangroves of the Sunderbans do not fall within its scope.

The old leaves mostly fall in the hot season and are immediately followed by the new leaves together with the flowers. The fruits ripen very quickly.

**CICCA.** A genus containing a single species, which has been united by some authorities with the large genus *Phyllanthus*, from which it differs chiefly in its fleshy fruits, those of *Phyllanthus* being more or less dry and crustaceous. The leaves are alternately arranged in two rows on opposite sides of the twigs, so that the twigs often resemble single pinnate leaves divided into a number of leaflets. The flowers are small, without petals, and usually unisexual, but the two sexes are found on the same plant (monoecious). The male flower of *Cicca* has 4 stamens. The fleshy fruit contains a bony stone, within which are 3 or 4 seeds.

The genus *Phyllanthus* comprises over 400 species of trees, shrubs, and herbs, or which about 6 shrubs and herbs are found in lower Bengal.

**Cicca acida** (L.) Merr. *Syn.* C. disticha *Linn.* Phyllanthus distichus *Muell.—Arg.* P. longifolius *Roxb.*

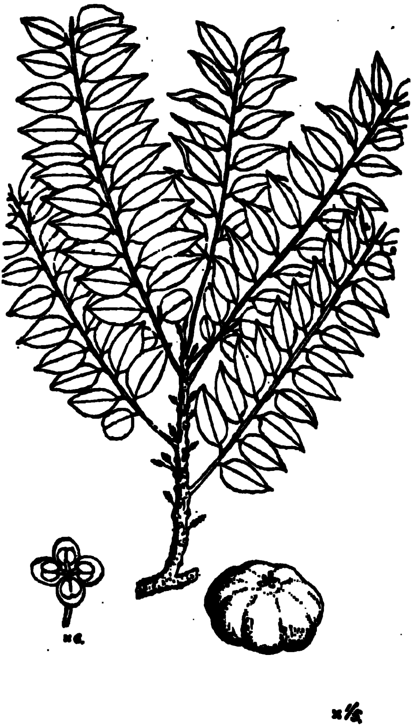
(Acida is Latin meaning "sour". Distichus is Latin meaning "arranged in two rows". Longifolius is Latin meaning "with long leaves.")

| | |
|---|---|
| Bengali, | *noari, nori, nubari, hariphal, loda.* |
| Hindi, | *harfarauri, chalmeri.* |
| English, | *Otaheite gooseberry, star-gooseberry, West India gooseberry, jimbling.* |

(F.I. p. 684. F.B.I. Vol. V. p. 304. B.P. Vol. II. p. 936.)

A small glabrous tree; branches robust; leaf-bearing branchlets slender, deciduous, clustered near ends of branches; leaves pinnately distichous, ovate, acute or acuminate, 1 to 2½ inches long; petiole short; flowers minute, in slender racemes from the thick branches, male and female (and occasionally hermaphrodite) crowded together; males pink or red, females green, larger; sepals 4; stamens 4; styles 3 or 4, bifid; drupe globose, flattened, 6- to 8-lobed, up to 1 inch long.

This small tree has smooth, grey bark and rather thick branches, from near the ends of which spring a number of slender, soft, green or reddish twigs which fall off seasonally and leave prominent scars behind them on the lower parts of the branches. The leaves are set on short stalks, are thin and membranous in texture, and have sharp points; they are arranged in two rows (usually not in opposite pairs) along the twigs, so as to give the impression of a single "pinnate" leaf divided into a number of leaflets,—an impression which is strengthened by the fact that the whole twig with its leaves is shed in the manner of a single leaf. Along the stouter branches the minute pink, reddish-brown, or greenish flowers are borne in slender clusters, male, female, and sometimes bisexual, flowers being crowded together in the same clusters. The fruits, which are sometimes found in dense masses, are like large, round, ribbed, pale green or whitish buttons; they have a hard stone in the centre with an acid fleshy covering.



*CICCA ACIDA*

The fruits make a delicious preserve and are commonly used for pickling, and the green leaves are eaten as a vegetable. Medicinally the fruits are employed as a liver-tonic, and to enrich the blood. The root and seed are cathartic.

The wood is light brown in colour and fairly hard.

The tree is a native of the Malay Islands and Madagascar. It is much cultivated in India, and is not uncommon in and about Bengal villages.

The trees flower mostly in the hot weather, and produce ripe fruits in the early part of the rains. Sometimes a second crop of fruits is produced later in the year.

**EMBLICA.** (A latinized form of the common Indian vernacular name). A genus of one species, which was formerly included in the genus *Phyllanthus*, from which it differs principally in having 3 stamens united into a column, and fleshy fruits. (See under *Cicca* above).

**Emblica officinalis** Gaertn. *Syn*. Phyllanthus Emblica *Linn*.
(Officinalis is Latin meaning "used in medicine").

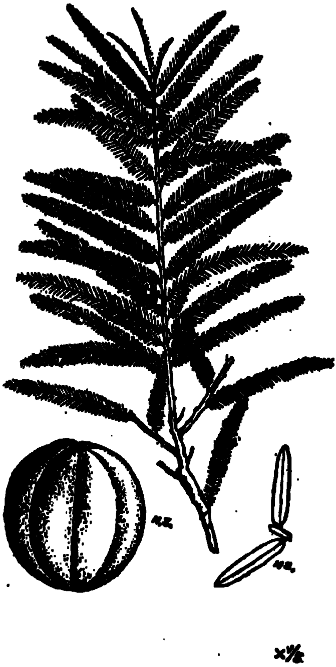
| | |
|---|---|
| Bengali, | *amla, ambolati, yeonla.* |
| Hindi, | *amla, aonla, amlika.* |
| English, | *emblic myrabolan.* |

(F.I. p. 684. F.B.I. Vol. V. p. 289. B.P. Vol. II. p. 935.)

A deciduous tree; leaves ⅓ to ½ inch long by ⅛ inch wide, subsessile, distichously close-set on deciduous branchlets, oblong, obtuse; flowers monoecious, densely fascicled along the branchlets, usually below the leaves; male flowers many, pedicelled; females few, subsessile; fruit globose, fleshy, obscurely 6-lobed, ½ to ¾ inch diam., yellow or pink when ripe.

This is a small or middle-sized tree with smooth, greenish-grey bark. Its trunk is sometimes very gnarled and fissured, and when sliced the bark is of a deep red colour. The feathery, drooping foliage has a light, sparse look and is quite distinctive owing to the very numerous, small, and narrow leaves, which are closely arranged in two rows on opposite sides of the twigs, which thus resemble a single "pinnate" leaf. Along the young twigs the small greenish-yellow flowers are borne in dense clusters, generally on the naked portions of the twigs below the leaves. The flowers are unisexual, but the male and female flowers are mingled on the same twigs, the male on short stalks and the female closely pressed to the stems. The acid fruit is yellow or reddish when ripe, and consists of a hard nut containing six seeds, the whole surrounded by a fleshy outer covering, having a general resemblance to a yellow or pink gooseberry, but with six shallow lobes. The fruits are very acid and astringent, but are occasionally eaten raw. They are often made into a pickle, and also (with sugar) into a sweetmeat. The leaves and fruits are good fodder for cattle.

The emblic myrobolan is an important article in Indian medicine. The fruit is used for a variety of medicinal purposes, especially as a liver tonic. The raw fruit is often eaten as an aperient. The flowers are also aperient, and the leaves are prescribed for dysentery and as a tonic. A fermented liquor made from the fruit is considered a remedy for jaundice, dyspepsia, and coughs.



*EMBLICA OFFICINALIS*

The fruit, leaves, and bark contain tannin, and are much used for tanning skins, though often in conjunction with stronger tanning material, such as the true myrabolans. The fruit in particular is a useful tanning agent. The fruit, leaves, and bark are also employed for dyeing purposes, though only together with other materials; it appears that they play the part of a colour concentrator rather than of dye.

The wood is red, hard, and close-grained, weighing 45 to 56 lb. per cubic foot; it is tough and flexible, but apt to warp. When well seasoned it is used for building purposes, furniture, agricultural implements, and also (partly because it is durable when submerged, and partly because it is supposed to have the property of clearing dirty water) for making rings to support the sides of wells. Small twigs and chips of the wood are thrown into muddy water to make it clear.

The dried fruit is detergent and is used as a shampoo for the head. It is also much valued for making ink and hair dyes.

Hindus regard this tree as sacred to Ganesha and the leaves are used in his puja. The ripe fruits eaten as food and medicine for forty days are prescribed as a means of rejuvenation by the ancient medical savant and sage Charaka.

This plant is a native of tropical and subtropical India, Ceylon, China, and Malaya. It is occasionally found near Calcutta, but is not very common.

The flowers appear during the hot season and the fruits ripen during the following cold weather.

This tree together with several other closely related plants has the unusual characteristic of shedding its twigs with the leaves attached. This is a very exceptional peculiarity in the case of broad leaved trees, though not uncommon with conifers.

**PUTRANJIVA.** ("Child-life" in Indian vernaculars). A genus of two species of trees, natives of India and Ceylon, distinguished by the fleshy fruit containing a single large seed, and the male flowers having from 2 to 4 stamens only.

**Putranjiva Roxburghii** Wall. *Syn.* Nageia Putranjiva *Roxb.*

(Roxburghii is after William Roxburgh, the first superintendent of the Royal Botanic Gardens, Calcutta).

| | |
|---|---|
| Bengali, | *jiaputa, putranjiva.* |
| Hindi, | *jiaputa, juti, patji, jivputrak, patigia, putajan, putijia, putrajiva.* |
| English, | *child-life tree, lucky bean tree, Indian amulet plant, wild olive.* |

(F.I. p. 716. F.B.I. Vol. V. p. 336. B.P. Vol. II. p. 936.)

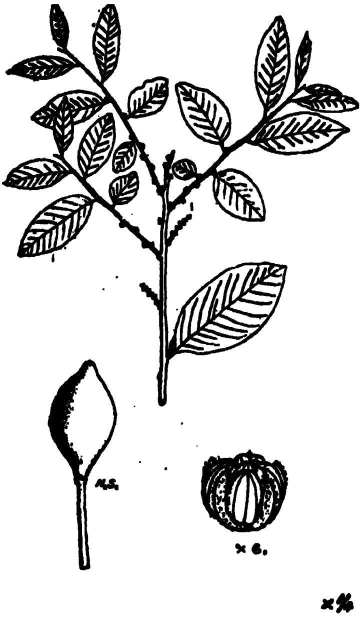
A nearly glabrous tree; leaves alternate, obliquely ovate or ovate-lanceolate, distantly serrulate or entire, 2 to 3 inches long, coriaceous, shining; petiole ¼ inch; flowers monoecious or dioecious, apetalous, yellowish; males in dense axillary fascicles; females solitary or few together; drupe ellipsoid, white-tomentose, on pedicel ½ to 1 inch long; endocarp pointed, very hard, 1-seeded.

This is a fair-sized evergreen tree with dark grey bark, and rather narrow, shining, dark green leaves, which are usually arranged in two rows on either side of long drooping twigs. The minute inconspicuous flowers are unisexual, and the two sexes are usually found on different trees. The fruits are whitish or greenish and about ¾ inch in length, each containing one hard, nut-like stone.

This graceful tree is commonly planted on roadsides for its shade and is very suitable for this purpose owing to its rather low, spreading branches and dense evergreen foliage. It is very common in Calcutta and in the neighbouring country.

The principal fame of the tree depends on the widespread belief that the stones of the fruit ward off the evil eye, and protect the lives of children. The nuts are strung together into amulets, and are frequently worn by Hindu fakirs, Brahmans, and particularly by children. Various vernacular names of the tree are derived from this belief, and the scientific name of the genus has been taken from the Indian languages.

The leaves and stones of the fruit are used for treating colds and fevers. The seeds yield an oil which is sometimes extracted and used for burning, and the leaves are lopped for cattle-fodder.



*PUTRANJIVA ROXBURGHII*

The wood is grey, shining, fairly hard, and close-grained ; it is used for turning, making tools, and for structural work ; its weight is said to vary from 36 to 49 lb. per cubic foot.

The tree is a native of all parts of tropical India, but is not common in the wild state.

The flowers appear from March to May, and the fruit takes about 12 months to ripen.

The seeds are largely disseminated by the agency of animals, which eat the fruit ; in towns this is largely done by fruit-eating bats.

A distinct variety of this plant, with silvery-white bark and an erect habit very unlike the spreading growth of the common variety, is sometimes met with. These trees seem to flower much more seldom than the common ones, and may prove to be sterile.

**ANTIDESMA.** (Greek "anti", for, and "desma", a band, in allusion to the use of the bark for cordage). A genus of about 60 species of trees and shrubs, natives of tropical Asia, Africa, Australia and the Pacific, of which about 30 species are found in India, and two in West Bengal. The genus is known by its minute petalless flowers in small, close spikes, and by the presence of only two seeds in the fleshy fruit. The male and female flowers are on separate trees (dioecious).

In addition to the plant described below, *A. diandrum* Roth. (Bengali, *multa*), a large shrub with narrow, pointed, shining leaves, is found occasionally near Calcutta. Its very small red or black fruits are edible, and the leaves are also eaten as spinach. The foliage turns red before falling in the spring.

**Antidesma Ghaesembilla** Gaertn. *Syn.* A. paniculata *Roxb.*

(Ghaesembilla is a Ceylonese name. Paniculata is Latin meaning "with flowers in panicles").

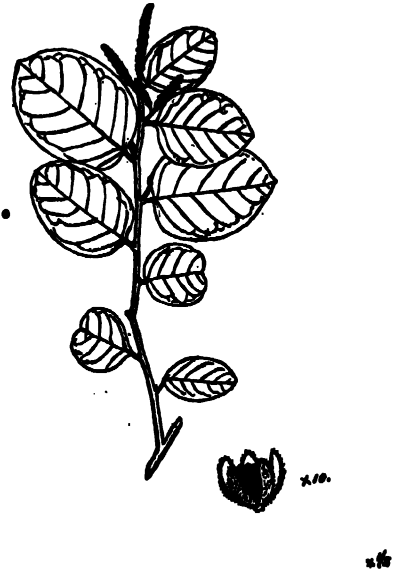
| | |
|---|---|
| Bengali, | *khudi jamb, tim toa.* |
| Hindi, | *umtoa.* |
| English, | *black currant tree.* |

(F.I. p. 718. F.B.I. Vol. I. p. 357. B.P. Vol. II. p. 938).

A deciduous shrub, or small tree ; branchlets and lower sides of leaves tomentose ; leaves alternate, broad-elliptic, rounded at both ends, 2 to 4 inches long, petiole about ⅛ inch long ; flowers dioecious, in slender, tomentose, panicled racemes ; sepals woolly ; stamens 4 to 7 ; ovary pubescent ; fruit red or black, 1/6 to ¼ inch diam., subglobose.

This is a small, compact tree or shrub, with grey or pale brown bark, and rusty-coloured down on the twigs and on the backs of the leaves. Many minute flowers are arranged in narrow spikes clustered at the ends of the twigs, the male and female flowers being found on separate trees, the male spikes purplish or yellowish, and the female greenish-brown. The very small spherical fruits are red or black when ripe. The leaves grow on short stalks, and are usually rounded at both ends.

The acid fruit is said to be edible and the leaves are occasionally used for giving an acid flavour to food.



ANTIDESMA GHAESEMBILLA

The wood is said by some authorities to be hard and even-grained, but by others to be soft and coarse-grained. It is used for making light rafters in huts, but is of little value.

The leaves are prescribed for the treatment of various ailments, e.g., headache, abdominal swellings, and scurf. An infusion of the leaves is sometimes employed as a bath in cases of fever.

The tree is indigenous in most of the hot and damp parts of India, and also in Ceylon, Malaya, China and Australia. It is not uncommon in jungles and village shrubberies near Calcutta.

The flowers appear from March to May and the fruits ripen about the end of September. The leaves are changed at the end of the cold weather.

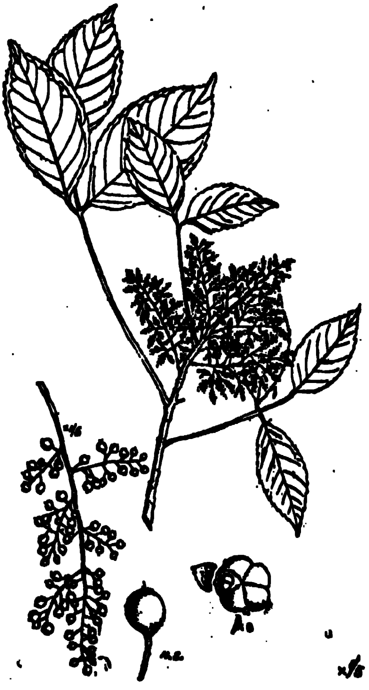
**BISCHOFIA.** (After F. W. Bischoff, a professor at Heidelberg in the early 19th century). A genus consisting of a single species, distinguished from all others of the family by its leaves consisting of three separate leaflets (trifoliolate).

**Bischofia javanica** Blume. *Syn.* Micraelus Raeperianus *Wight & Arn.*
Andrachne trifoliata *Roxb.*
(Javanica means from Java).
Hindi, *bhillar, irum, kain, kotsemba, paniala, pankain.*
English, *Java cedar, West Indian cedar, vinegar wood.*

(F.I. p. 703. F.B.I. Vol. V. p. 345. B.P. Vol. II. p. 926).

A glabrous tree; leaves alternate, trifoliolate; leaflets often crenate, elliptic or obovate, acuminate, 3 to 7 inches long; petiole 1 to 6 inches; flowers dioecious in axillary or lateral panicled racemes, apetalous, green; male sepals 5, concave, obtuse, imbricate, hooded over the anthers; stamens 5; female sepals 5, ovate, caducous; styles long, linear, entire; fruit globose, fleshy, smooth, black, ¼ inch diam.

This is a large, round-headed, deciduous tree with nearly smooth, dark brown bark. The leaves, each of which consists of three large, shining, pointed leaflets, and the drooping clusters of minute greenish flowers, are quite distinctive. Male and female flowers are borne on separate trees. The fruit is a smooth, blue-black, fleshy berry containing several smooth shining seeds.



*BISCHOFIA JAVANICA*

The juice of the leaves is considered a cure for sores.

The timber is useful for structural and general utility purposes; it is rather weak but easily worked and durable, especially in contact with water, for which reason it is often used for bridges and boat-building. It weighs about 45 lb. to the cubic foot. It has a beautiful grain, and does not warp.

The tree is a native of the subhimalayan forests, Assam, Chota Nagpur, Chittagong, Burma, the western Peninsular, Malaya, and the Pacific Islands, but not of western Bengal. It is occasionally planted near Calcutta. Specimens may be seen in the Calcutta Zoo, and on the banks of the boat canal in Alipore.

The flowers appear from February to April, when the male trees are sometimes hung with masses of pale green flowers.

The fruits ripen at the beginning of the cold season.

**ALEURITES.** (Greek "floury"). A genus of 4 or more trees, natives of Asia and the Pacific Islands, of which one is naturalised in India. The genus is known by its flowers having petals, the nerves of the leaves radiating outwards from the ends of the stalks, and the fleshy fruit containing a single seed. The genus includes *A. Fordii* Hemsl. from which most of the valuable tung oil of commerce is obtained.

**Aleurites moluccana** Willd. *Syn.* A. triloba *Forst.*

(Moluccana means "of the Moluccas". Triloba is Latin meaning "having 3 lobes", in allusion to the shape of the leaves).

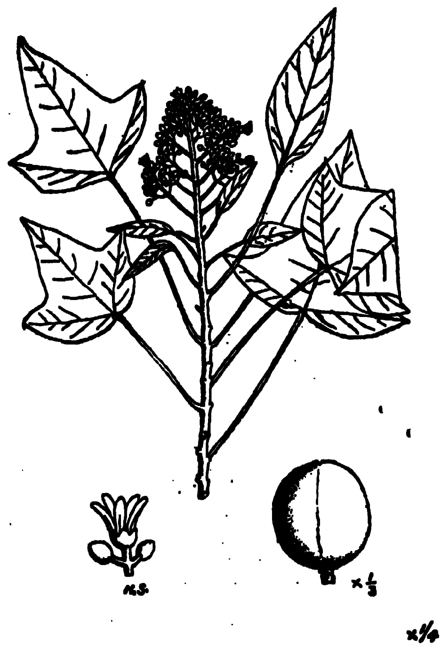
| | |
|---|---|
| Bengali, | *akola, akrot, jangli akrot.* |
| Hindi, | *akola, jangli akrot.* |
| English, | *Belgaum walnut, Bengal walnut, candle nut, Lumbang nut, Bencoolen nut.* |

(F.I. p. 670. F.B.I. Vol. V. p. 384. B.P. Vol. II. p. 942.)

A tall evergreen tree; shoots, young leaves, petioles, and inflorescence stellately tomentose; leaves ovate or triangular, lobed, 4 to 12 inches long; petiole 2 to 5 inches; flowers monoecious, white, in large terminal panicles; calyx subglobose, 2- to 3-lobed; petals 5, ½ inch long; stamens 15 to 20; ovary 2- to 5-celled, styles bifid; drupe 2 to 2½ inches diam., subglobose, fleshy, greenish.

This is a fair-sized evergreen tree with rough, brownish-grey bark, and large lobed leaves, very variable in shape. The small white flowers are numerous, and appear in loose clusters at the ends of the branches. Each flower has five white petals, and either a number of stamens or three styles, each of which is divided into two branches. The male and female flowers are found mingled on the same tree. The fruit consists of a nut-like seed contained in a fleshy berry with an olive-green husk, which almost exactly resembles the fruit of a walnut.

The kernel of the seed is edible but has little taste; its flavour somewhat resembles that of a walnut, but its consistency is more like that of a roasted chestnut. An oil extracted from the seed is edible and is used for making candles in Europe. It is also said to be a useful substitute for the valuable tung oil which is obtained from other species of *Aleurites* that have been much cultivated in China and are now being introduced into India. The nuts are sometimes strung together and used as candles.



*ALEURITES MOLUCCANA*

The oil has been found to have medicinal qualities not unlike those of castor oil, though it has no unpleasant taste or smell.

The timber is soft and of poor quality but can be used for making packing cases and for similar purposes. It weighs about 38 lb. per cubic foot.

The tree is indigenous in the Malay Archipelago, and is cultivated in most warm countries. It is found all over the plains of India and is occasionally planted in and about Calcutta. A specimen grows on the west side of the Calcutta Zoo (in 1942).

The flowers appear from February to June and the fruits ripen during the rains.

## ULMACEAE

A family of trees and shrubs with watery sap, and undivided, but usually toothed or notched, leaves arranged in two rows on either side of the stems. The minute flowers are bisexual or unisexual, with from 4 to 9 sepals and usually the same number of stamens, which do not uncoil elastically as in closely allied families. The fruits are various in form, but never split open to release the seeds, which number 1 or 2 only.

The family takes its name from *Ulmus*, the genus which includes the English elm. In India the family is not of great importance.

Some authorities have combined this family with *Moraceae*, and *Urticaceae*, the very large nettle family, under the heading *Urticaceae*.

**TREMA.** (Greek, "a hole", in allusion to the pitted seeds). A genus of about 20 shrubs or trees, natives of the tropics and sub-tropics.

The leaves are not arranged in opposite pairs, have notched edges, and 3 to 7 nerves meeting at the base of the leaf. The flowers are minute, unisexual or bisexual, in small clusters at the bases of the leaf-stalks. The genus is distinguished from others by the fruit, which is succulent with a central stone, and by the sepals of the male flowers, which do not overlap one another.

**Trema orientalis** Blume. *Syn*. Celtis orientalis *Roxb*.
(Orientalis in Latin means "eastern").

| | |
|---|---|
| Bengali, | *jilan, chikan, chikun, jupong.* |
| English, | *charcoal tree, Indian nettle-tree.* |

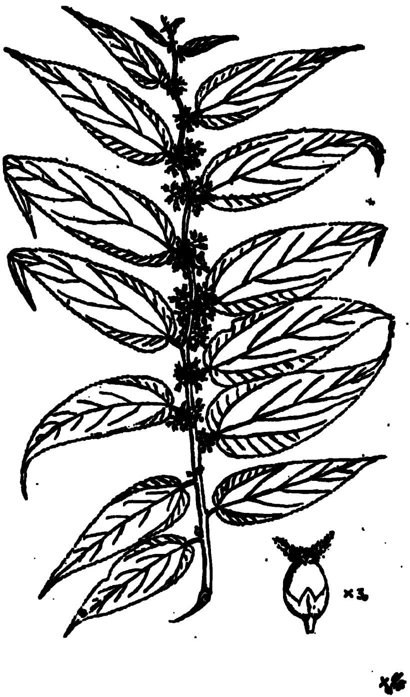
(F.I. p. 262. F.B.I. Vol. V. p. 484. B.P. Vol. II. p. 960).

A small tree or shrub; trunk ringed with stipular scars; branchlets silkily pubescent; leaves alternate, distichous, ovate or lanceolate, acuminate, oblique, base cordate, dentate, 2 to 6 inches long, scabrid above, white-tomentose below; petiole ¼ to ⅓ inch; flowers monoecious, minute; cymes axillary, longer than petiole; male cymes compact; female cymes lax; drupe 1/6 inch long, glabrous.

This is a small, evergreen quick-growing, short-lived tree or shrub with straight, spreading branches and thin greyish-brown bark. Its leaves are toothed and rather narrow, rough above and often silvery-white below. The minute, whitish flowers and small, black fruits are borne near the bases of the short leaf-stalks.

A fibre, which is used for tying roof-rafters and other purposes is obtained from the inner bark; it can also be used for making ropes and a kind of coarse cloth. The fruits are sweet and edible, though too small to be eaten except in times of scarcity.

The wood is very light and soft. It was formerly used to make charcoal for the manufacture of gunpowder, but otherwise is of little value.



*TREMA ORIENTALIS*

The tree is native in most of the damper parts of India, including Bengal. It springs up abundantly as soon as a clearing is made in a forest. It occurs frequently in hedges and thickets near Calcutta, and is not uncommon in parks and gardens, though it has little to recommend it as an ornamental plant.

The flowers are found from December to April and again during September and October.

# MORACEAE

A family of about 55 genera of trees and shrubs with milky sap. The leaves are seldom set in opposite pairs, are not divided into separate leaflets, and have large "stipules", i.e. leaflets growing on the stem at the base of the leaf-stalk. The minute, unisexual flowers are often combined on the exterior, or in the interior, of "receptacles," which may be spherical or cylindric, and solid or hollow. The stamens of the male flowers uncoil elastically as the flowers open.

Though their flowers are inconspicuous, the members of this family comprise some of the most typical and imposing of Indian trees, which are of great importance as shade-givers.

Some authorities combine this family with *Ulmaceae*, and with *Urticaceae*, the nettle family.

**STREBLUS.** (Greek, "streblos", crooked). A genus of two species of trees or shrubs, natives of India and Malaya, with rough leaves. The male flowers are in heads or spikes, but the females are solitary, and have fleshy sepals, which enclose the fruit. The two sexes are found on separate trees (dioecious). One species only is found in Bengal.

**Streblus asper** Lour. *Syn.* Epicarpurus orientalis *Blume.*
Trophis aspera *Roxb.*
(Asper in Latin means "rough". Orientalis means "eastern").

| | |
|---|---|
| Bengali, | *shiora.* |
| Hindi, | *siora, sahora, dahia, karchanna, rusa, daheya.* |
| English, | *Siamese rough bush.* |

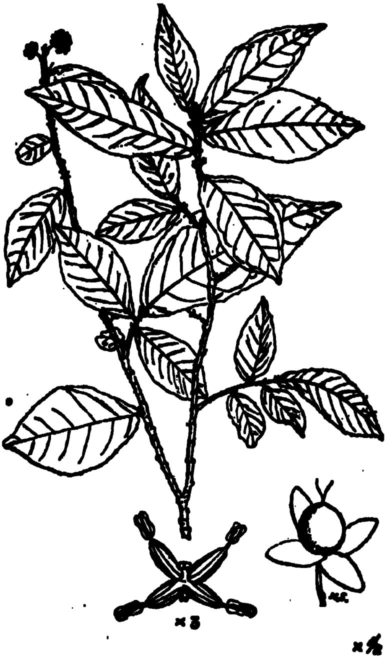
(F.I. p. 714. F.B.I. Vol. V. p. 489. B.P. Vol. II. p. 969.)

A shrub or small tree; branchlets hairy; leaves elliptic or obovate, irregularly dentate, rough on both sides, 2 to 4 inches long; petiole very short; flowers dioecious; males in globose heads, minute, sepals 4, connate at base, imbricate, stamens inflexed in bud, later projecting; females solitary, on fascicled or solitary peduncles; berry pisiform, yellow, succulent, 1/6 inch long.

This is a rigid shrub, or a scraggy, gnarled tree with milky juice, small, irregularly shaped, dark green leaves, and inconspicuous white or yellowish flowers, which are unisexual, the male and female flowers growing on different trees, the male in spherical heads, and the female singly or in small clusters. The flowers of both sexes are borne close to the twigs and branches. The bark is soft, grey in colour and stringy.

The fruits are said to be edible, but can only be described as exceedingly unattractive, though they are greedily eaten by birds; they resemble small yellow peas. The leaves are a favourite food of goats, which often prevent the plant from developing into more than a stunted bush.

Various parts of the plant are considered to have medicinal value, and are used for a variety of ailments. Some authorities state that the bark contains an irritant poison, but decoctions of the bark are said to be given in cases of fever and dysentery. The roots are prescribed as an application to ulcers. The milky juice has astringent and antiseptic properties, and is applied to sore heels and chapped hands.



*STREBLUS ASPER*

The twigs of this plant are much used in Bengal as toothbrushes, and are believed to be an excellent cure for pyorrhoea of the gums.

The rough leaves are collected for polishing wood and ivory. The milky juice has been used to coagulate milk, which it is said to accomplish very readily. Paper has been made from the bast.

The timber is white, fairly hard, tough and elastic. It weighs about 45 lb. per cubic foot. It is sometimes used for cartwheels, and makes excellent fuel.

In Southern India, in April and May, the twigs of this tree are stuck in the thatch of houses to ward off lightning.

The tree is a native of most parts of India including the dryer regions, and is abundant near Calcutta in thickets and shrubberies. It may often be found growing in close contact with, and supported by, the trunk of a larger tree.

The flowers appear in February and March, and the new leaves are mostly produced at the same time as the flowers.

**MORUS.** (The ancient Latin name of the mulberry). This is a genus of about 8 species of trees and shrubs, natives of tropical and temperate countries. The leaves are often lobed, and their nerves radiate outwards from the base of the leaf. The male flowers are in narrow spikes, and the females in compact, more or less cylindrical heads, which become succulent when the fruits ripen, forming a compound berry consisting of many one-seeded divisions (carpels).

In addition to the species described below, *Morus nigra* Linn., the black mulberry of English gardens, is occasionally grown in India, usually in hill stations. This has broad, firm leaves with 5 principal nerves, densely hairy sepals and styles, and purple fruits. In gardens in the plains another species, *M. laevigata* Wall., a native of the Sikkim Terai, is sometimes planted. This is a handsome tree with light grey bark, broad, long-pointed leaves, and both male and female flowers in slender spikes up to 5 inches in length.

**Morus alba** Linn.
(Alba in Latin means "white", in allusion to the colour of the fruit).

| | |
|---|---|
| Bengali, | *tut.* |
| Hindi, | *chinni, chun, tul, tulklu, tunt, tut, tutri.* |
| Urdu, | *shahetuta, shatuttursh.* |
| English, | *white mulberry, mulberry.* |

(F.I. p. 658. F.B.I. Vol. V. p. 492. Not in B.P.) .

Leaves ovate, dentate, often lobed, base often cordate, acuminate or not, 2 to 4 inches long, basal nerves 3 to 5 ; petiole ½ to 1 inch long ; flowers monoecious, the sexes often on distinct branches, greenish ; male spikes puberulous, about 1 inch long, flowers not crowded ; female spikes solitary, ovoid, pedunculate ; fruit up to 2 inches long, white, red, or nearly black when ripe.

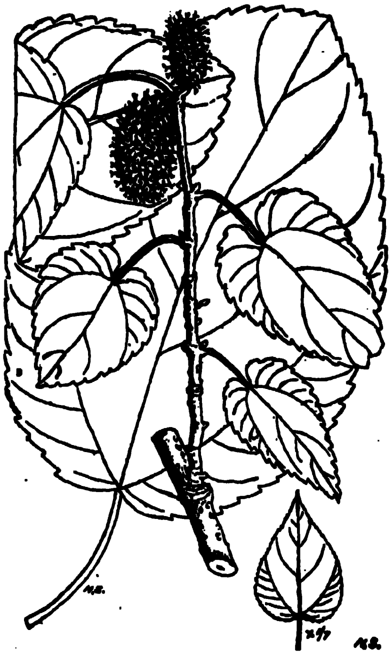
This is a small or medium-sized tree with rather rough, brown bark, and broad leaves which vary greatly in shape, although they are always pointed and have toothed edges. On young trees the leaves are usually lobed, but those of a mature tree are often without lobes. The greenish flowers are unisexual, but the two sexes grow on the same tree, though often on separate branches. The male flowers are in small slender spikes, and the female in compact egg-shaped or cylindrical heads, which develop into succulent berries made up of many minute fruits joined into one. The berries may be white, red, or nearly black when they ripen.

There are many varieties of this tree, the fruits of which differ greatly in quality, those of the better kinds being considered a great delicacy by Indians. In Kashmir and Afghanistan the fruits form an important article of diet, and are sometimes dried to make a kind of flour.

The leaves are extensively used for feeding silk-worms, and also to increase the yield of milk by cows. The timber is hard and even-grained, weighing from 38 to 56 lb. per cubic foot, that of younger trees being lighter than that of mature trees. It is used for building, furniture, boats, agricultural implements, and also as a substitute for ash-wood in making cheap tennis rackets, cricket stumps, etc. It has a pretty silvery grain. The bark yields a fibre, which has been used for paper-making, and the twigs, on account of their strength and toughness, are collected to tie loads and for similar purposes.

The fruit is used medicinally as a cure for sore throat, dyspepsia and melancholia. The bark is purgative, and the root-bark is employed as a tonic, and to cure nervous disorders.

*Morus alba* is indigenous only in northern and western Asia, but is much cultivated throughout northern India, and is the principal food-plant of silkworms in the north-west of India and Kashmir. A very closely allied form is wild in the lower Himalayas and the hills of China and Japan; this is *Morus acedosa* Griff. (*Syn. M. indica* Linn.), the Indian mulberry, which is usually said to differ from *M. alba* in having small, scarcely edible fruits, which are dark purple when ripe, and leaves that have long, tapering (acuminate) points; the styles of the female flowers are also said to be longer than those of *M. alba*, and to be joined below, while those of *M. alba* are said to be short but separate. In practice, however, none of these distinctions seem to be either constant or dependable, and it may be decided that *M. acedosa* should be regarded as no more than a variety of *M. alba*, which is certainly a species that has been much modified by centuries of cultivation in



*MORUS ALBA*

many countries, and includes forms almost indistinguishable from *M. acedosa.*

The latter is the plant usually grown in Bengal and Assam for feeding silkworms, but in the neighbourhood of Calcutta the commoner forms appear to be nearly typical of *M. alba,* and are grown for their edible fruits. The best varieties have fruits up to two inches in length, very sweet and juicy, and with a flavour very like that of *M. nigra,* the black mulberry of Europe.

The flowers are produced in February and March and the fruits ripen very quickly. The trees are deciduous for a short period at the end of the cold season. Propagation is effected by seeds or cuttings, and fruit is produced within six years from seed and within two or more years from cuttings. The plants are very hardy, but may need pruning in the cold weather.

**BROUSSONETIA.** (After T. N. V. Broussonet, a French naturalist). A genus of 3 species of trees or shrubs, natives of Malaya, China and the Pacific Islands, closely allied to *Morus,* the mulberries, from which they are principally distinguished by the female flowers of *Broussonetia* being in spherical and not in elongated heads. The trees are dioecious (i.e. the male and female flowers are found on separate trees).

**Broussonetia papyrifera** Vent.

(Papyrifera means "paper yielding").

English, *paper mulberry.*

(F.B.I. Vol. V. p. 490. B.P. Vol. II. p. 967. Not in F.I.).

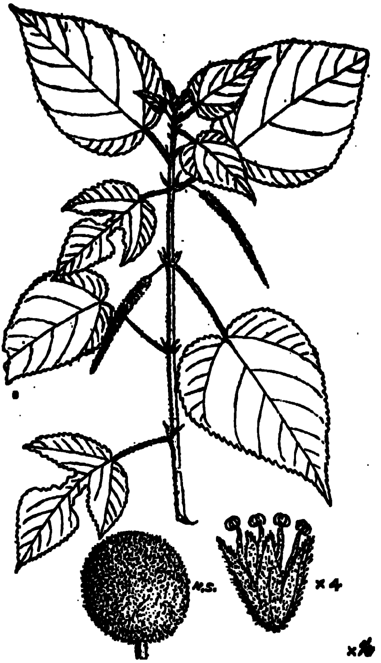
A middle-sized, deciduous, dioecious tree or shrub; leaves ovate, dentate, often lobed, rough above, tomentose below, 3 to 8 inches long; petiole 2 to 3 inches; male flowers minute, in pendulous spikes 2 to 3 inches long; female flowers in globose heads ½ to 2/3 inches diam.; fruit of many exserted stipitate achenes, aggregated in small heads, fleshy below, crustaceous above, reddish.

This is a small or medium-sized tree, frequently grown as a shrub, having smooth, grey bark marked with longitudinal striations. Its leaves are toothed and often lobed, and irregular in shape. The male trees bear drooping catkin-like spikes of flowers from near the bases of the leaf-stalks, but the female trees have spherical, hairy heads about ¾ inch across, from which the ripe seeds eventually project on long fleshy stalks.

The bark, after being stripped to ribbons and retted in water, yields a fine white fibre, for which the tree has been extensively cultivated in various countries. From this fibre the Pacific Islanders used to make their only clothes, and it has also been made into paper and cardboard. When cultivated the tree is grown in coppice form to produce long, clean shoots. Its growth is extremely rapid.

The wood is soft, light, and of little value.

The tree is a native of Burma, Malaya, and the Pacific Islands. It is a remarkable instance of a plant which can thrive in both temperate and tropical climates, for it flourishes at Dehra Dun, where it is cultivated on a considerable scale, and it grows equally well on the plains. It is occasionally found planted near Calcutta, and also occurs spontaneously.



*BROUSSONETIA PAPYRIFERA*

The flowers appear from January to March.

**ARTOCARPUS.** (From the Greek "artos", bread, and "karpos", fruit). A genus of about 40 species of trees, all natives of East Asia, of which 18 species are found in India. The leathery leaves are not set in opposite pairs, and have veins which branch from a central midrib. The minute flowers are crowded on the outside of spherical or cylindrical heads (receptacles), the male and female flowers being in separate heads but on the same tree (monoecious). The female heads swell as they ripen, and eventually become large, fleshy, composite fruits, which in some species are succulent and edible. Each male flower contains one stamen only.

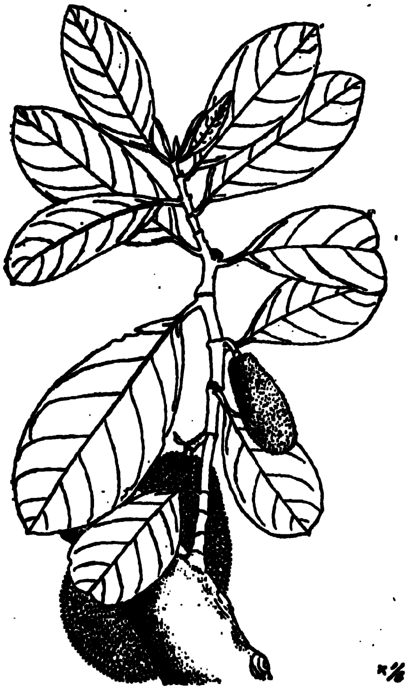
In addition to the 2 trees described below, *A. incisa* Linn., the bread-fruit tree of the South Sea Islands, is occasionally planted in Bengal. This is a small tree with large, deeply lobed leaves, and spherical fruits borne near the ends of the branches.

**Artocarpus integra** (*Thunb.*) *Merr.* *Syn.* A. integrifolia *L.f.*
(Integra is Latin meaning "whole", or "entire". Integrifolia is Latin meaning "with leaves having unbroken, smooth edges".)

| | |
|---|---|
| Bengali, | *kathal.* |
| Hindi, | *chakki, kanthal, panos, panasa.* |
| English, | *jack tree.* |

(F.I. p. 633. F.B.I. Vol. V. p. 541. B.P. Vol. II. p. 971).

A large evergreen monoecious tree; leaves alternate, coriaceous, elliptic or obovate, 4 to 8 inches long, narrowed into a petiole ½ to 1 inch long; stipules large, caducous; flower heads at first enveloped in leathery cylindric stipules; male heads cylindric, 2 to 6 inches long; female cylindric, tubercled when mature, up to 30 inches long by 12 inches wide, hanging from the trunk and larger branches, or sometimes on the roots; sepals 2, oblong or spathulate, tips pubescent; seeds reniform, oily.



*ARTOCARPUS INTEGRA*

This is an evergreen tree of moderate size with a rather short, thick trunk, dark brown, rough and warty bark, and a dense rounded crown composed of dark green, shining foliage. Its rather narrow leathery leaves grow on somewhat short stalks, and are of a deep, smooth, glossy green above, but are paler beneath with a very prominent midrib. The minute flowers are unisexual, (the two sexes being found on the same tree), and grow densely clustered on the surface of compact cylindrical heads, which hang from the trunk and the thicker branches, the male and female flowers in separate heads. The flower-heads at first are greenish in colour, and about the size of a man's thumb, or a little larger, and are enclosed in yellowish sheaths, which, however, soon fall off. The male heads rapidly turn brown and wither, but the female heads develop into enormous, cylindrical, greenish fruits, ill-shapen and rough on the outer surface, containing many kidney-shaped seeds about the size of a nutmeg, embedded in soft, fibrous pulp. The flowers and young fruits have a sweet smell.

The flowers appear in the cold season, and the fruits ripen during the hot weather. Young trees bear only male flower-heads, which appear on the smaller branches; the female flower-heads grow on the trunks of older trees mingled with the male flower-heads. Some very old trees produce their fruits on their roots, in which case the position of the fruit is only disclosed by the cracking of the earth above it.

The fruits are said sometimes to attain a weight of 80 lb. each, and although such a size must be very exceptional, this plant undoubtedly provides a valuable supply of food for the poorer people of India ; for it is common everywhere, and each mature tree produces every year several immense fruits, which are much appreciated by the poorer classes. Some richer people also eat the fruit, more especially the large, white seeds, which are cooked and served with curries, and are said to be as good as the best chestnuts. When ripe, the fruit usually has a very strong smell, which is disgusting to those not accustomed to it. The pulp is soft, yellowish, and unattractive ; it is eaten raw, or cooked in a variety of ways. The immature fruits are often cooked and eaten as a vegetable, known in Bengal as *echar*.

There are several types of this tree, differing in the consistency of the ripe fruits, some of which have a hard pulp, and others a soft and watery. Firminger says that the former are called ***khujja*** and the latter ***ghila***, the exterior of the fruit of the ***khujja*** being smoother and the leaves rounder than that of the latter variety.

The tree yields an excellent timber, much used for musical instruments, cabinet making, building, and similar purposes. It is lemon-yellow at first, but turns with age a dark red like mahogany, to which it is said to be little inferior. The weight is about 40 lb. to the cubic foot.

The leaves and juice are considered to have medicinal properties. The juice is applied to glandular swellings and a fomentation of the leaves to wounds.

In Burma the wood is used to dye the clothes of Buddhist priests. An excellent bird-lime can be made from the copious milky juice, which abounds in the uneatable parts of the fruit and in all the softer parts of the tree.

The tree is a native of the Western Ghats. It is widely cultivated throughout the eastern tropics, and is common in all parts of lower Bengal.

**Artocarpus Lakoocha** Roxb.

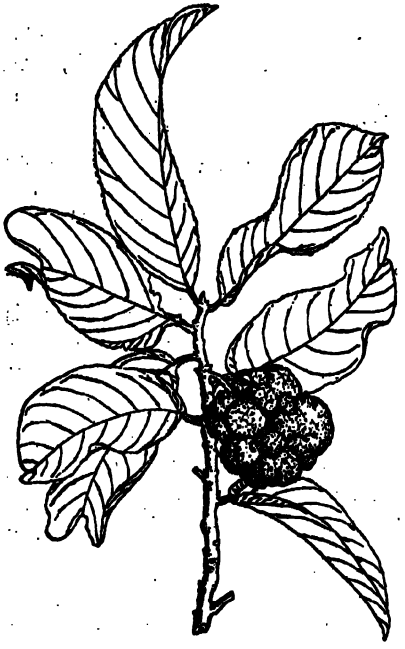
(Lakoocha is a latinized form of the Sanskrit name).

| | |
|---|---|
| Bengali, | ***dephal, lakucha, dahu, dehua, madar.*** |
| Hindi, | ***badahara, barhal, dahu, dhao, lakuch.*** |
| Urdu, | ***barhal.*** |
| English, | ***monkey jack.*** |

(F.I. p. 634. F.B.I. Vol. V. p. 543. B.P. Vol. II. p. 971.)

**A middle-sized deciduous tree; young shoots and leaves beneath densely tomentose; leaves coriaceous, entire, elliptic or ovate, smooth above, 6 to 10 inches long; petiole 1 inch; receptacles axillary; males subsessile, spongy, ovoid, ¾ to 1 inch long, orange-yellow; females pedunculate, irregularly subglobose; sepals 2 to 4; stamen 1; syncarp irregularly lobed, 2 to 4 inches diam., velvety; seeds oblong.**

This is a handsome tree of moderate size, with a rather short trunk, and a large, rounded, spreading head. The bark of the younger branches is fairly smooth, but that of the trunk is brown and very rough. The rather large, leathery, dark green leaves are smooth above but downy beneath, and grow on somewhat short stalks. Many minute flowers are clustered on the outer surface of reddish heads, which grow at the bases of leaf-stalks. The flowers are unisexual, the male and female flowers being found on the same tree, but in separate heads. The male heads, which are spongy, and orange-yellow in colour, soon wither and fall; but the female heads develop into irregularly shaped fruits with velvety, smooth rinds, which, when ripe, are usually yellowish, or "the colour of dirty wash-leather", as Firminger describes them; but sometimes they have a pink tinge.



*ARTOCARPUS LAKOOCHA*

During the cold season the leaves fall, but are replaced in March, at which time the flowers also appear. The orange lumps of male flowers are borne in some profusion and give the tree a gay look for a short time. The fruits ripen early in the rains. A second crop of male flowers is sometimes produced in July.

This tree is a native of most of the damper parts of the plains of India, Malaya, and Ceylon. It is not uncommon in jungles and near villages all over Bengal, and is sometimes planted for shade as well as for its edible flowers and fruits. Propagation is effected by seeds, and the young trees bear fruit within six years.

The ripe fruits have an austere taste, but are sometimes eaten raw, and are much used for making chutneys. The male flower-heads are also eaten, either raw or pickled. The bark is sometimes chewed with *pan*.

The timber is heavy and durable, and being very resistant to white-ants and other insects, is used chiefly for piles, house-posts, beams, rafters, and dug-out canoes; its weight is about 40 lb. per cubic foot. The roots are said to yield a yellow dye.

The seeds are considered a good purgative for children, and the milky juice is also used as a purgative. The bark is a remedy for skin-diseases, and the fruit is regarded as a liver-tonic.

**FICUS.** (The ancient Latin name for the edible fig, *F. Carica* Linn.) This is a genus of trees, shrubs, and climbers with minute flowers located inside hollow, fleshy "receptacles", which are often taken for fruits and are generally known as "figs". The flowers are of several kinds, of which the most important are three, male flowers, female flowers, and gall flowers. The male flowers have 3 or 5 sepals and 1, 2 or 3 stamens; the female flowers may have several sepals as in the case of the males, or may take the form of a cup; they contain an ovary which on fertilisation develops into a nut-like fruit containing a single minute seed. The gall flowers resemble the female flowers but have a shorter style and are incapable of developing into a fruit; their function is to form homes for the pupae of minute wasp-like insects, which are dependent on these plants for shelter, and on which the plants are dependent for the fertilisation of their flowers. The male and female flowers are in some species found in the same fig, and sometimes in separate figs, which are then usually on separate trees; the gall flowers grow in the same receptacle as the male flowers. The insects, on maturing, force their way out of the figs by holes made by them at the apex of the fig, and make their way inside another fig containing female flowers. It is not clear to what extent fertilisation depends on pollen brought in this way from male flowers to female flowers, or to what extent it is brought about asexually by the stimulation of the female flowers caused by the presence of the wasps. A number of species of wasp are known to inhabit different species of *Ficus*, and some species of insect and plant may be mutually exclusive. A great deal remains to be learnt about this remarkable symbiosis and about the curious methods by which fertilisation of the plants is secured, but it is clear that without the insects the seeds of the plants could seldom, if ever, be produced, and without the plants the insects could find no suitable place to lay their eggs.

There are about 600 species of *Ficus*, mostly in East Asia and Polynesia, of which about 80 are found in India and about 12 in lower Bengal. As well as the trees described below the genus includes *F. pumila* Linn, a creeper that grows tightly pressed to vertical surfaces, and is often planted in Calcutta to hide bare expanses of wall; it also includes *F. Carica* Linn., the edible, or common fig, which is cultivated in the dryer parts of India, but does not thrive in Bengal.

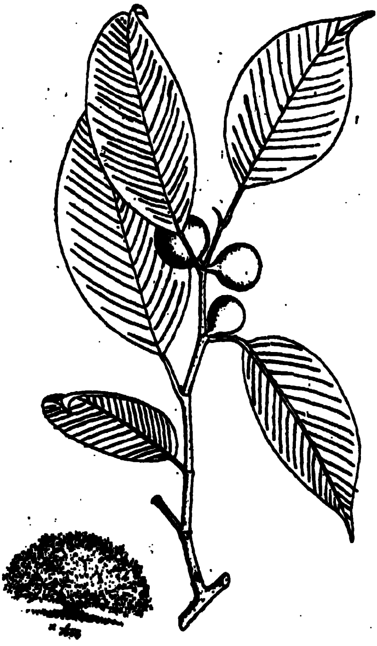
**Ficus comosa** *Roxb.* *Syn.* F. Benjamina *L.* *var.* comosa *Kurz.* (Benjamina seems to be a corruption of a Sanskrit name. Comosa means "with hairy tufts").

| | |
|---|---|
| Bengali, | *pakur.* |
| English, | *Java fig, Java willow, willow fig.* |

(F.I. p. 644. F.B.I. Vol. V. p. 508. B.P. Vol. II. p. 979.)

An evergreen, glabrous, spreading tree; leaves alternate, thinly coriaceous, shining, ovate, shortly acuminate, 2 to 4 inches long; petiole ½ to 1 inch, grooved; receptacles sessile in axillary pairs, orange when ripe; about ½ inch diam.; male, female, and gall flowers in the same receptacle; monandrous.

This is an imposing and graceful evergreen tree, usually branching from the base, with thin, smooth, grey bark, wide-spreading limbs, and drooping branches, of which the outermost twigs often reach nearly to the ground. The leaves are dark green, not closely set, and smaller than those of most other figs; their long points usually distinguish them from the leaves of *Ficus retusa,* the only other species with which this tree is likely to be confused. From the end of March to May the branches are studded with "figs", or receptacles, which are always in pairs, and are bright orange in colour when ripe, giving the tree a very gay look. From the branches usually hang a few aerial "drops", which occasionally take root in the ground, and form subsidiary trunks, as in the case of the banyan.



*FICUS COMOSA*

A decoction of the leaves mixed with oil is used as a dressing for ulcers, and the milky juice is used for treating the eyes of young babies.

The wood is moderately hard, grey in colour, and beautifully mottled. It weighs about 43 lb. to the cubic foot.

In Assam this tree is used as a host plant for the lac insect.

This species is a native of most of the wetter parts of India, but not of western Bengal. It is occasionally planted in Calcutta, but not as often as its beauty merits. Some very fine specimens are to be seen in the Calcutta Zoo.

The new leaves are mostly produced in the early part of the hot season. As well as the main crop of "figs", which is produced in the hot season, a second crop often ripens about the month of August.

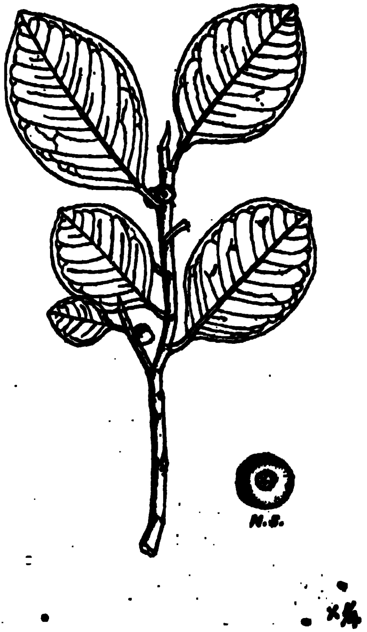
**Ficus retusa** Linn. *Syn.* F. nitida *Thunb.*

(Retusa means "with a slight notch at a rounded apex", alluding to the shape of the leaf. Nitida means "shining").

Bengali, *jir, kamrup.*

(Not in F.I. F.B.I. Vol. V. p. 511. B.P. Vol. II. p. 980.)

A large, evergreen, glabrous tree ; leaves alternate, broadly elliptic, ovate or obovate, obtuse or bluntly acuminate, 2 to 4 inches long ; petiole ¼ to ½ inch long ; receptacles sessile in axillary pairs, ⅓ inch diam., white purplish or reddish when ripe ; male, female, and gall flowers in the same receptacle ; monandrous.



*FICUS RETUSA*

This is a shady, spreading tree of moderate size, with fairly smooth, brown bark, and usually with a few aerial roots descending from the lower branches. It may generally be distinguished from the other fig trees found in Bengal by its small blunt leaves. The "figs", or receptacles grow in pairs at the base of the leaf-stalks, and are usually white or purplish in colour when ripe. The tree affords dense shade and is valuable as an avenue tree, but it is not common in Calcutta, though often planted in dryer districts.

The timber is described as light reddish-grey, close-grained, moderately hard, and beautifully mottled. The weight is about 40 lb. per cubic foot. It is used for fuel, and might prove useful for many purposes that require a timber with pretty graining.

The leaves and bark are considered to have medicinal qualities, and are applied to wounds and bruises. In China the aerial roots are mixed with salt, dried and powdered, and applied to the teeth as a cure for toothache. The bark and leaves are used for headache.

The tree is a native of most of the damper parts of India, Burma, Malaya, China, and New Caledonia. It is occasionally planted in Calcutta and in neighbouring villages. A specimen may be seen (in 1944) on the north side of the Zeerut Bridge. In its natural state the tree starts life as an epiphyte on rocks or another tree, i.e., it uses the rocks or tree as a support until it is able to stand alone.

The small figs ripen from March to May, and the new leaves appear in January and February. The figs are much eaten by pigeons.

**Ficus elastica** *Roxb.*

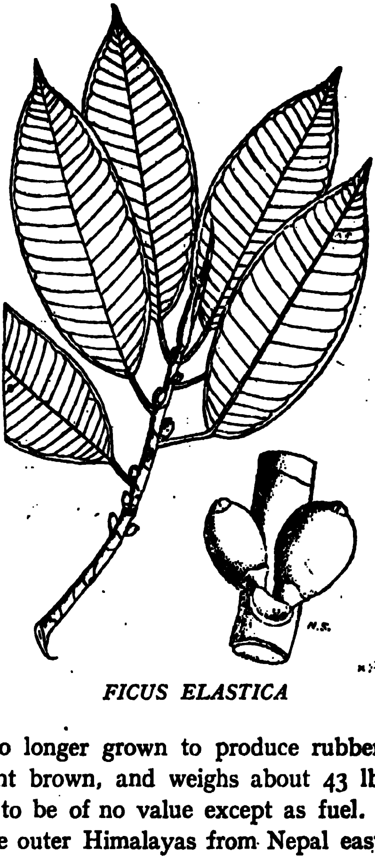
(Elastica means "yielding India-rubber").

| | |
|---|---|
| Bengali, | *attah bar.* |
| English, | *rubber tree, Indian caoutchouc tree, rambong.* |

(F.I. p. 640. F.B.I. Vol. V. p. 508. Not in B.P.)

A very large glabrous tree; leaves alternate, coriaceous, shining, elliptic, shortly acuminate, 5 to 10 inches long; petiole ½ to 2½ inches long; stipules up to 6 inches long, generally pink, caducous; receptacles in pairs in the axils of fallen leaves, covered at first by caducous involucres; when ripe greenish-yellow, ovoid-oblong, about ½ inch long; male, female and gall flowers in the same receptacle; monandrous.

This is a large (sometimes gigantic) tree with fairly smooth, reddish-brown or grey bark, and handsome, leathery, shining leaves, which are pointed and often three times as long as broad. It may be distinguished from all other figs, and indeed from most other trees, by the unusual arrangement of the nerves of the leaves, which are very numerous and nearly parallel, running almost at right-angles to the prominent midrib (after the manner of *Calophyllum inophyllum*); and also by the very large pinkish-yellow "stipules" or sheaths, in which the young leaves are wrapped. These stipules are several inches long and fall to the ground as soon as the leaf opens. The trunk of the tree is sometimes heavily buttressed. The aerial roots are few, and seldom form separate trunks, but the terrestrial roots sometimes spread over the surface of the ground for a considerable distance. In the axils of the leaves on the shorter twigs. the "figs", or receptacles, grow in pairs ; when ripe they are elongated in shape and bright yellowish-green in colour.



*FICUS ELASTICA*

The tree was the first source of India-rubber and for a long period its milky-white sap provided the material from which erasers were made. This rubber was first prepared and used by the wild tribes of Assam, and subsequently, in the latter half of the nineteenth century, the tree was cultivated on a considerable scale in that province. Nowadays, however, almost all the natural rubber used in the world is obtained from *Hevea brasiliensis* Muell-Arg., a tree of the family *Euphorbiaceae*, a native of Brazil, and now extensively cultivated in South India, Ceylon, Malaya, and other tropical countries. *Ficus elastica* is no longer grown to produce rubber.

The wood is white or light brown, and weighs about 43 lb. to the cubic foot. It is stated to be of no value except as fuel.

This tree is a native of the outer Himalayas from Nepal eastwards, Assam, and Upper Burma. It is not uncommonly planted in Calcutta gardens, but seldom grows to be a very large size in lower Bengal.

The receptacles mostly ripen in the rains. The new leaves are mostly produced at the end of the cold season, when the foliage turns a very bright, fresh green.

**Ficus infectoria** *Roxb.*

(Infectoria means "dye-yielding").

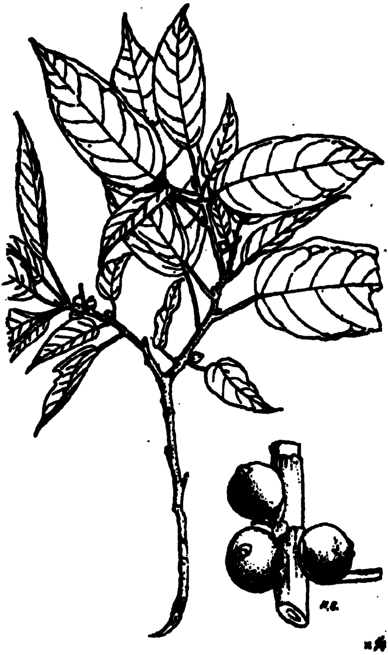
| | |
|---|---|
| Bengali, | *pakur, pakar.* |
| Hindi, | *pilkhan, kahimal, keol, khabar, pakri.* |
| Urdu, | *pakharia.* |

(F.I. p. 643. F.B.I. Vol. V. p. 515. B.P. Vol. II. p. 981.)

A large, spreading, deciduous tree, epiphytic when young ; leaves alternate, thinly coriaceous, glabrous, ovate elliptic or oblong, shortly

**acuminate, margins undulate, 3 to 6 inches long; petiole 1 to 3 inches long; receptacles sessile or shortly peduncled, usually in axillary pairs, ¼ to ⅓ inch diam., whitish or reddish, spotted when ripe; male, female, and gall flowers in the same receptacle; monandrous.**

This is a handsome, quick-growing tree with a dense crown of shining foliage, spreading branches, and a short trunk that is often knobbly and irregular like that of a peepul. A few aerial roots are sometimes dropped from the branches. The smooth, pale greyish bark flakes off in irregular patches. There is great variety in the size and shape of the leaves, which sometimes makes this species difficult to recognise, but its leaves may generally be known from those of other fig-trees by their narrow shape and wavy-edges. They are leathery, quite hairless, and not set in opposite pairs, and they have a short projecting point at the apex. The small "figs", or receptacles, are inconspicuous; they usually grow in pairs, each pair at the base of a leaf-stalk, and are whitish or reddish when ripe.



*FICUS INFECTORIA*

The old leaves fall during the cold season but the branches remain bare for a few days only and the new leaves open suddenly in January, February, or March. The young foliage for a short time is very brilliant, but the colour varies from a clear pale green to pink or bronze. Those trees that change their leaves in January (which are almost the first of all trees to recognise the coming of spring), usually turn bright emerald green, but those that wait till March to acquire their new foliage are generally copper-coloured for a brief period.

The bark of this tree yields a coarse fibre suitable for cordage. The young shoots are occasionally eaten in curries, and the figs are also said to be edible. The leaves make good fodder for cattle and elephants.

The grey timber is fairly hard but not durable, and of very little economic use except for making charcoal.

All parts of the tree are believed to have medicinal properties. The bark in particular is used, along with the bark of four other species of *Ficus* and with that of *Azadirachta indica*, to make a gargle and a wash for wounds.

This species is indigenous in most parts of India as well as in Ceylon, Malaya, and China. It is commonly planted on roadsides in Bengal and is often found in village shrubberies. It is fairly plentiful in Calcutta and some fine specimens may be seen on the Maidan, especially near the Kidderpore Bridge (in 1944). A number of distinct varieties have been described and several are represented in the city.

The figs ripen from February to August.

**Ficus Rumphii** Bl. *Syn.* F. cordifolia *Roxb.*

(Rumphii is commemorative of G. E. Rumpf, a Dutch botanist of Amboina. Cordifolia is Latin meaning "with heart-shaped leaves").

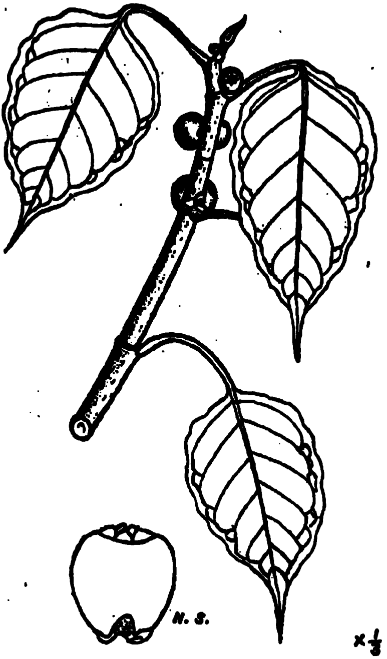
| | |
|---|---|
| Bengali, | *gaiasvattha, gaiaswat.* |
| Hindi, | *gagjaira, gajna, kabar, pakar.* |

(F.I. p. 642. F.B.I. Vol. V. p. 512. B.P. Vol. II. p. 980).

A glabrous tree, often epiphytic; leaves alternate, broad-ovate, undulate, 4 to 6 inches long, with a tail at the apex about 1/6 the total length of the blade, basal nerves 3 to 5, lateral nerves 3 to 6 pairs; petiole 2 to 3 inches, slender; receptacles sessile in pairs, black when ripe, whitish with dark spots when young, globose, ¼ inch diam.; male, female, and gall flowers in the same receptacle; monandrous.

This is a tree of moderate size, often with a crooked trunk and an unshapely habit of growth. Its bark is smooth, grey, and rather thick, and the branches are numerous and spreading. The smooth, shining, broad leaves have rather wavy edges and a pronounced tail at the apex; they grow on long, slender stalks, which cause them to tremble in the slightest breeze, so emphasising the difference in colour between the dark green of the upper side of the leaves and the paler under-surface. The small "figs", or receptacles, grow in pairs, and are black when ripe, but whitish with black spots when young.

This tree closely resembles the peepul (*Ficus religiosa*, see below), and is often mistaken for it; but it can be distinguished quite easily by its rather narrower leaves with much shorter tails only about one sixth the length of the whole leaf; by the three to six pairs of veins that spring from the central vein of the leaf compared with the eight or more pairs of the peepul; and by the almost spherical receptacles. Like the peepul, this tree is often epiphytic (i.e. dependent on the support of other trees, or of buildings), and often destroys its host, but it seems to be much less destructive to walls than the peepul. Owing to its smaller size and rather ungainly habit, it is less suitable for planting as a roadside tree than the banyan, the peepul, and several other species of figs.



FICUS RUMPHII

The timber is very soft and spongy, and is of little value except as fuel, but the bark yields a rough cordage fibre. In Assam the tree is used as a host plant for the lac insect. The ripe figs are occasionally eaten by men, and the leaves and branches make good fodder for cattle, elephants, and other animals. The juice and fruit are reputed to have medicinal qualities as emetics and anthelmintics.

The tree is indigenous in all the damper parts of the plains of India, and is common in Calcutta, though less abundant than the peepul.

The leaves fall during the latter half of the cold season and the beginning of the hot season, and are replaced soon after. The "figs", or receptacles, appear at most times of the year, and may be noticed in great numbers when the branches are nearly bare of leaves in the spring.

**Ficus religiosa** Linn.

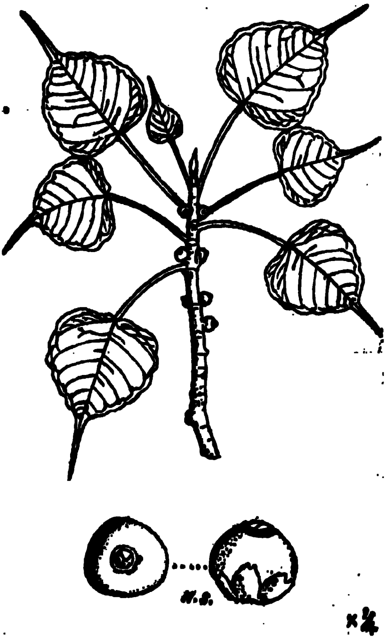
(Religiosa is Latin meaning "pertaining to religion" or "sacred").

| | |
|---|---|
| Bengali, | *asvattha, asud.* |
| Hindi, | *pipal, pipli.* |
| English, | *peepul.* |

(F.I. p. 642. F.B.I. Vol. V. p. 513. B.P. Vol. II. p. 980.)

A large glabrous tree, often epiphytic ; leaves alternate, pendulous, broad-ovate, margins undulate, apex produced into a tail about ⅓ the length of the whole blade, in all 4 to 7 inches long, basal nerves 3 to 7, lateral nerves about 8 pairs ; petiole 3 to 4 inches ; male, female, and gall flowers in the same receptacle ; monandrous ; receptacles in axillary pairs, dark purple when ripe, about ½ inch diam., vertically compressed.

The peepul is a large, spreading tree with fairly smooth, pale greyish bark, which peels off in roundish flakes of irregular size. The trunk is erect, but rather short, round in small trees, but in old trees full of inequalities in the shape of large perpendicular ridges, knobs, and hollows. Many long, crooked branches spread widely in all directions, the lower often being nearly horizontal. The perfectly smooth, broad, shining leaves with wavy edges, long pointed tails at the apex, and slender pendulous stalks, are very distinctive ; they are of a deep shining green above but paler below, and they tremble in the gentlest breath of air, constantly flickering as a result of the contrast between the darker and lighter sides of the leaves. Whenever the slightest breeze passes through them, their long, hard, pointed tips tap gently on the surfaces of neighbouring blades, making a pattering like that caused by a shower of rain. The small "figs", or receptacles, grow in pairs, each pair at the base of a leaf-stalk, and are purplish-black when ripe.



*FICUS RELIGIOSA*

The long tail at the apex of the leaf is an exaggerated form of a shape that is common in the leaves of plants adapted for life in very wet climates. The tail causes rain-drops to drain away quickly from the surface of the leaf, so allowing it to resume its respiratory functions as soon as possible after a shower of rain.

As in the case of the banyan tree (*Ficus bengalensis*, see below), the seeds of the peepul are carried by birds, and usually germinate either on other trees or on the walls of buildings. Many trees are eventually killed by peepuls that fasten on them in this way, the peepuls then taking root, and ultimately replacing the hosts upon which they at first relied for support. It must not be thought, however, that such trees as the banyan and the peepul are parasitic on other trees ; for they obtain their nourishment, until they are able to take root in the ground, from the air and the rain, and they do not draw on the sap of their hosts, as do certain parasitic plants. When the seedling begins life on buildings, the roots penetrate into interstices of the masonry and soon cause its destruction.

Hindus regard the peepul as very sacred because it is supposed to be the abode of the goddess Bhawani. In ancient times, when modern ways of producing fire were unknown, its wood was used to ignite tinder by rubbing two pieces of the wood together, and on certain important occasions the same method is followed today for lighting sacrificial fires. The "bo" tree at Budh Gaya, beneath which Gautama Buddha received enlightenment, was of this species and is now represented by a successor on the same spot. Men and women desirous of children walk round a peepul on Saturday mornings 108 times repeating certain mantras. The ancient sage Barahamihira advocated the planting of a peepul together with a banyan tree in front of a dwelling in order to bring prosperity and happiness to the occupant or owner. The peepul is considered to be the male counterpart of the neem, or margosa, tree (which is regarded as female), and a wedding ceremony is sometimes celebrated between the two trees by planting a young neem close to a peepul and conducting the usual rites connected with marriage. These and other beliefs and customs cause the peepul to be regarded with great reverence and the destruction of a tree is considered a sin. As a result considerable damage is done in Bengal to walls and buildings, the trees often being allowed to flourish in places where their roots must do great harm.

The milky juice of the peepul after being allowed to harden into a gum, is occasionally used as sealing wax ; and bird-lime is also made from the juice. The tree is an important host-plant of the lac insect. The bark has been used for tanning, and a fibre was formerly extracted from the bark for the manufacture of paper.

Almost all parts of the tree are considered to have medicinal properties. The bark in particular is astringent, and is used for various medicinal purposes.

The figs and young leaf-buds are occasionally eaten in times of scarcity and famine. The leaves are good fodder for elephants, buffaloes, and cattle.

The timber is of inferior quality, very light and coarsely fibrous ; it is only used for fuel and for making packing cases.

The peepul is indigenous in Bengal, near the foot of the Himalayas, and in Burma, and is cultivated all over India, but is rare in very dry regions. In Bengal it is frequently planted in villages and as a roadside tree, and also occurs spontaneously everywhere on other trees and on walls.

The tree varies greatly as regards the shape and size of the leaves, in the time of producing new leaves, and in their colour, which is sometimes a beautiful pale green, and sometimes pink or reddish. The tree is leafless for a short time in the hot season or at the end of the cold season.

The receptacles, or "figs", ripen in May or June, and the new leaves are produced mostly from February to April. The trees are usually thronged with birds when the receptacles are ripening.

**Ficus bengalensis** Linn. *Syn.* F. indica *Roxb.*
(Bengalensis means "from Bengal". Indica means "from India").

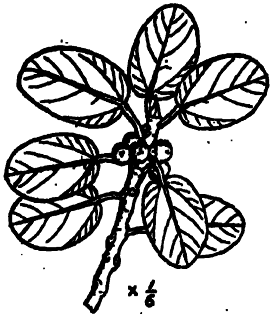
| | |
|---|---|
| Bengali, | *bar, bot, but.* |
| Hindi, | *bar, bargad, ber, bor.* |
| English, | *banyan.* |

(F.I. p. 639. F.B.I. Vol. V. p. 499. B.P. Vol. II. p. 979.)

A large evergreen tree, epiphytic when young, usually rooting from the branches ; young shoots pubescent ; leaves alternate, coriaceous, glabrous when mature, ovate, base cordate or rounded, 4 to 8 inches long by 2 to 5 inches wide ; petiole ½ to 2 inches long, stout ; receptacles sessile in axillary pairs, globose, puberulous, red when ripe, ½ to ¾ inch diam. ; male, female, and gall flowers in the same receptacle ; monandrous.

The banyan is a large tree, occasionally attaining a height of as much as 100 feet, with spreading, almost horizontal branches, which often send down aerial roots to the ground beneath ; having obtained a footing in the earth, the aerial roots develop into additional trunks, and the tree is thus enabled to spread outwards to an indefinite extent. The thin, greyish bark peels off in irregular strips, and the leaves are broad and leathery with rather short, stout stalks. The "figs", or receptacles, grow in pairs at the bases of leaf-stalks, and are usually bright red when ripe, resembling cherries ; but yellow figs are sometimes seen.

There are several distinct varieties of this tree, some of which send down few, or no, aerial roots, and there is also a considerable variation in the foliage. The new leaves of one striking variety are reddish, and turn the tree a beautiful copper-colour when the fresh foliage appears in the spring.



*FICUS BENGALENSIS*

The banyan is one of the most common and probably the best known of all Indian trees, for its aerial roots, and sometimes numerous trunks, make it both conspicuous and distinctive, (though a few other species of the genus *Ficus* have a similar method of growth on a less pronounced scale). It is frequently seen on roadsides, and in villages, and about houses, where its survival is helped by the religious beliefs of the Hindus. Its sacred character seems to be due to the shade, shelter, and food that it gives to number of insects, birds, and other animals, thereby meritoriously supporting many animate creatures. The dry twigs are used for producing sacred fires and the leaves as sacred platters, and several religious ceremonies are connected with the tree. The planting of a banyan together with a peepul in front of a dwelling is enjoined as conducive of prosperity, and a banyan alone should be planted on the east of a house.

The tree usually originates from seeds dropped by birds on old walls and on other trees. Sometimes the seeds germinate in the natural receptacles formed by the bases of the leaves of palms, with the result that a banyan may often be seen embracing a palm, which it will eventually strangle and replace as an independent tree, whereupon it will then proceed to spread by means of aerial roots and numerous subsidiary trunks. The great banyan in the Royal Botanic Garden of Calcutta, one of the largest banyans in the world, is known to have originated in this way from a date palm in the year 1782. This banyan is still spreading outwards from the centre, but its original central trunk died many years ago, and is now being replaced by young trees, the branches of which are being grafted on to the branches of the original tree to make one continuous whole. Even larger trees are said to have existed in the past at various places ; a famous tree in the Andhra Valley was said to be 2,000 feet in circumference, to have over 3,000 trunks or aerial roots, and to be able to shelter 20,000 people beneath its shade.

The banyan, together with the peepul, does much damage to buildings in Bengal. Seeds, dropped by birds, germinate on roofs and walls, and the roots of the young trees penetrate the interstices of the bricks and eventually shatter the building. The religious beliefs of the Hindus often prevent the destruction of plants in such situations.

The banyan yields an inferior kind of rubber, and coarse ropes are made both from the fibrous bark and from the aerial roots. Paper has also been made from the bark, and the fibre was formerly used for slow-matches.

The milky juice of the tree is believed to have several medicinal uses, in particular as a tonic. The leaves are applied, heated as a poultice, to abscesses, and young leaves are thought to be good for leprosy. An infusion of the bark is said to be a powerful tonic and is used in the treatment of diabetes.

The small red figs are eaten by poor people in times of scarcity ; they are much sought after by birds, but are said to be poisonous to horses. The leaves are sometimes used as fodder for elephants.

The wood of the main trunk is of little value, but fairly hard and durable under water, weighing about 37 lb. per cubic foot. The wood of the "drops", or subsidiary trunks, is hard, and is used for tent-poles, cart-yokes, and umbrella handles, especially for umbrellas used on ceremonial occasions.

The English name of "banyan" is said to originate from the fact that the tree was supposed to be the favourite of the banyas, or Hindu traders.

The tree is indigenous near the foot of the Himalayas, and in Western India, and is commonly planted all over the country. Numerous banyans occur on the Calcutta Maidan, some of them being of the variety without aerial roots. A fine specimen with a number of stout "drops" can be seen on the north side of Belvedere House.

The ripe figs appear from April to June, and on some trees up to December. New leaves usually appear in February and March, but sometimes in September and October. It may sometimes be noticed that different parts of the same tree observe different seasons of flowering and leaf-producing, a fact that may be explained by assuming that the tree originated from more than one plant and that the separate plants have grown together by a natural process akin to grafting.

* * * * * *

*Ficus Krishnae* C. de C., an extraordinary form of *Ficus bengalensis*, is occasionally found in Calcutta gardens. In this variety the leaves are doubled near the base so as to form a cup-shaped, or cone-shaped structure.

There is a legend that the god Krishna transformed these leaves into cups in order to use them for drinking.

This tree was described by C. de Candolle in 1901 as a separate species, but Dr. K. Biswas, the superintendent of the Royal Botanic Gardens, Calcutta, has shown that this tree is no more than a variety of *F. bengalensis*. (See "Current Science", Vol. III, No. 9, March 1935).

**Ficus hispida** Linn. *Syn.* F. oppositifolia *Roxb.*
(Hispida is Latin meaning "with stiff hairs". Oppositifolia means "with leaves in opposite pairs").

| | |
|---|---|
| Bengali, | *dumar, kak dumar, jogdumur.* |
| Hindi, | *gobla, kat gular, kagsha, totmila.* |

(F.I. p. 647. F.B.I. Vol. p. 522. B.P. Vol. II. p. 981.)

A hispid shrub or small tree; leaves usually opposite, elliptic or obovate, entire or dentate, scabrid above, hispid beneath, 8 to 16 inches long; petiole ½ to 2 inches long; receptacles 1 inch long, turbinate or obovoid, hairy, usually clustered on long panicles hanging from old wood, yellowish when ripe; male and gall flowers in the same receptacles, females in separate receptacles; males monandrous.

This is an ugly shrub or a small tree, with grey bark peeling off in irregular flakes, and large, coarse, roughly hairy leaves, which are usually set in opposite pairs, but are occasionally arranged otherwise. On its lower side the leaf is strongly marked with prominent veins, and its margins are usually sharply but finely toothed. The "figs", or receptacles, are bigger than those of most other species of *ficus*, and are generally borne in drooping clusters hanging from the branches, and sometimes from the main stem not far above the ground, but also singly along the twigs in the axils of the leaves.

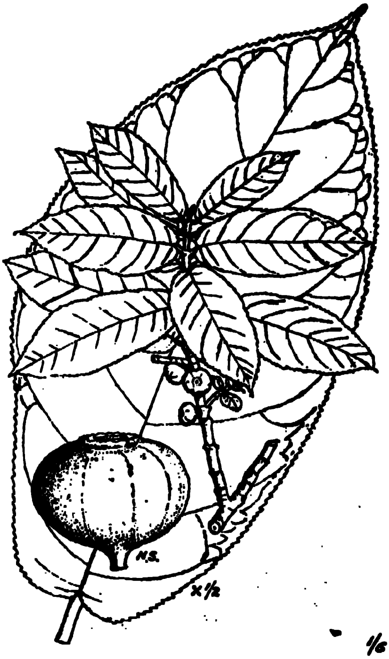
The figs, seeds, and bark are said to have valuable properties as emetics, and the powdered figs, heated with water, are used as a poultice. The figs are also given to cows to dry up their milk.

The young figs are eaten in curries. The leaves make good fodder for cattle and elephants, and the bark yields a coarse fibre.

The timber is soft and very light, and is put to no economic use.

This plant is indigenous in Bengal, Central and South India, Burma, Ceylon, China, and Australia. It is very common in jungles and on roadsides near Calcutta, and is sometimes seen in the town itself.

The figs appear abundantly from March to July, and in smaller numbers throughout the rains.



*FICUS HISPIDA*

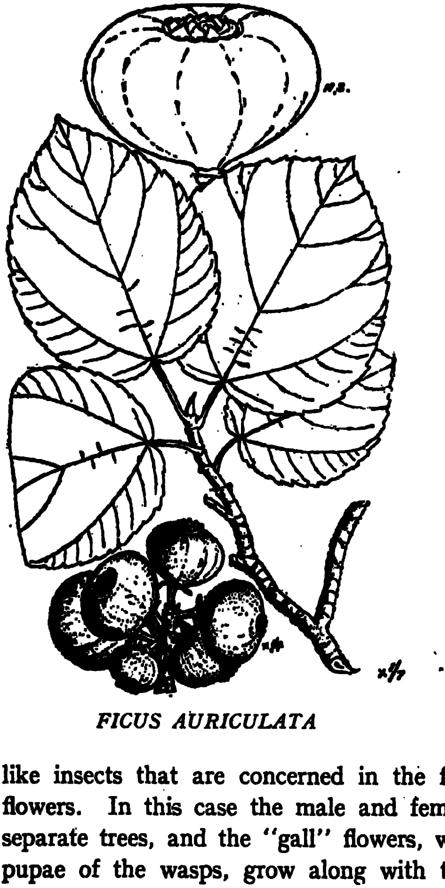
**Ficus auriculata** Lour. *Syn*. F. Roxburghii *Wall.* F. macrophylla *Roxb.*
(Auriculata is Latin meaning "ear-shaped." Roxburghii is a name commemorative of the botanist William Roxburgh of Calcutta. Macrophylla is from the Greek, meaning "with large leaves").

| | |
|---|---|
| Hindi, | *timla, tirmal.* |
| English, | *Eve's apron, Smyrna fig.* |

(F.I. p. 645. F.B.I. Vol. V. p. 534. B.P. Vol. II. p. 983.)

A low tree with a wide-spreading head; young branches pubescent; leaves alternate, thinly coriaceous, broadly-ovate to ovate-rotund, shortly acuminate, more or less cordate, entire or serrate-dentate, glabrous above, softly pubescent below, up to 15 inches long; petiole 1 to 4 inches; receptacles 2 inches diam. or more, pedunculate, turbinate or truncate-pyriform, brownish or purplish when ripe, crowded on short leafless branches, mostly near the base of the trunk; flowers dioecious, gall flowers in the same receptacles as the males; stamens of male flowers 1 to 3.

This is a low tree with a stout, short trunk, grey, warty bark, spreading branches, and enormous leaves, which are almost as broad as long, pointed at the apex, and more or less recessed where the stalk is joined to the base; the leaves are finely downy beneath, and their margins are often notched. The large "figs", or receptacles, are clustered on short, leafless twigs springing from the trunk and larger branches, many of them often being crowded at the foot of the trunk only a few inches above the ground; they are rather flattened on top and beneath they taper towards their short stalks; when ripe they are brownish in colour, with a tinge of red or purple. The whole plant is full of milky juice.



*FICUS AURICULATA*

As in the case of all other plants of this genus, the minute flowers are contained within the figs, which are inhabited by small wasp-like insects that are concerned in the fertilisation of the female flowers. In this case the male and female flowers are found on separate trees, and the "gall" flowers, which form homes for the pupae of the wasps, grow along with the male flowers. A full account by Dr. D. Cunningham of the phenomena connected with these insects is to be found in the Annals of the Royal Botanic Garden, Calcutta, Vol. I (1888), from which it appears that the wasps do not usually convey pollen from the male to the female flowers, but in some way stimulate the female flowers and so bring about parthenogenetic fertilisation without the presence of pollen. Dr. Cunningham records that the insects present in the Calcutta figs are of a different species from those that frequent the tree in its native habitat,—a fact that seems very hard to account for. The whole question of the fertilisation of the plants of this genus evidently requires further study.

The figs are edible and are often eaten in curries, but when raw they are usually very unpalatable, though on occasions they are said to have a pleasant flavour. They ripen from November to May.

A coarse rope can be made from the bark. The wood is reddish-grey and fairly hard, weighing about 34 lb. to the cubic foot.

The tree is a native of the outer Himalayas, Chota Nagpur, Orissa, Chittagong, Burma, China, and Formosa, but not of lower Bengal. It is fairly common in Calcutta gardens, where it is planted for its handsome evergreen foliage. The young leaves are beautifully tinted with pink or bronze.

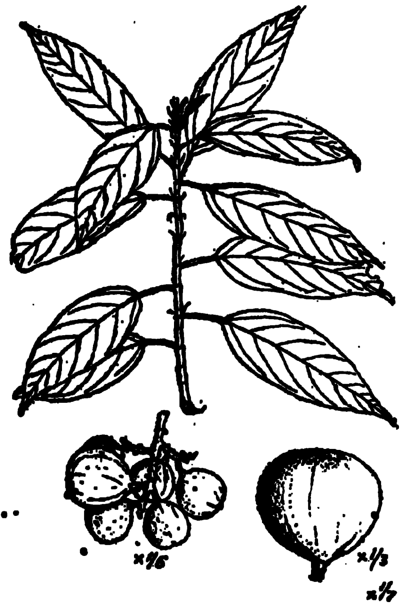
**Ficus glomerata** *Roxb.*

(Glomerata in Latin means "compactly clustered" in allusion to the figs.)

| | |
|---|---|
| Bengali, | *jagya dumar, yajna dumar.* |
| Hindi, | *umar, gular, paroa, lelka, umrai, tue, dimeri.* |
| Urdu, | *gular.* |

(F.I. p. 646. F.B.I. Vol. V. p. 535. B.P. Vol. II. p. 983.)

A middle-sized, nearly evergreen tree ; leaves alternate, membranous, entire, ovate or elliptic, 3 to 8 inches long, glabrous when mature ; petiole ¾ to 2 inches long ; receptacles globose or pyriform, on short leafless scaly branchlets from the trunk and larger branches, 1 to 2 inches diam., reddish when ripe ; male, female, and gall flowers in the same receptacles ; stamens 2.



FICUS GLOMERATA

This is a shady, spreading tree of moderate size, remarkable for its large, reddish, downy figs, which are mostly borne in clusters from the trunk and larger limbs, (though a few figs may sometimes also be seen among the foliage). Its bark is smooth and reddish brown or rusty-green in colour, marked with a few large cracks. The leaves are rather narrow, always pointed at the apex, and rather pale on the lower side. In Calcutta the tree usually changes its nearly evergreen foliage in November, an unusual time for this process to take place, and at that season the fresh new leaves are very beautiful and striking. The figs mature from April to July, and are purplish-red when ripe.

This tree is said to yield a gum of some value known as *chandarasa,* which is obtained from its milky juice, and is considered a kind of caoutchouc. Bird-lime is prepared from the juice of the stems, and a black dye can be made from the bark.

The fruit is very inferior and generally full of the maggots of the fertilising wasps (see the remarks above regarding the genus *Ficus*), but is occasionally eaten raw and in curries ; it can also be pounded, mixed with flour, and made into cakes. The fruit and leaves are used as fodder for cattle and elephants.

The leaves, bark, and fruit are employed in Indian medicine for a wide variety of purposes. The sap is also used, especially as an application in cases of mumps. The small blister-like galls that are common on the leaves, are soaked in milk, mixed with honey, and given to prevent pitting of the skin in small-pox. The bark is given to cattle when suffering from rinder-pest.

In some parts of India the tree is regarded as sacred, and there is a common belief that beneath every tree there runs a hidden stream. The wood is prescribed in Hindu scriptures for sacrificial fires, and the leaves and twigs are used in religious ceremonies.

The tree is indigenous in most parts of India including the dryer regions, where it grows only in damp places. Near Calcutta it is occasionally found in village shrubberies, but is not very common. A specimen may be seen near the south-west corner of the Tollygunge Golf Course.

## CASUARINACEAE

A family, with only one genus, comprising about 40 species of trees and shrubs, mostly natives of Australia. The plants have primitive characteristics, and their position in the system of classification has been much disputed. Their leaves are microscopic and the usual function of leaves is performed by slender, green, jointed twigs, usually drooping and bearing a superficial resemblance to the leaves of pine trees. The flowers are minute and unisexual, the females being borne in compact, cone-like heads, and the males in small spikes at the ends of the twigs.

**CASUARINA.** (Said to be derived from the Latin "casuarius", the cassowary, from the resemblance of the branches to feathers). The only genus of the family. Several species have been introduced into India, but only one is generally established.

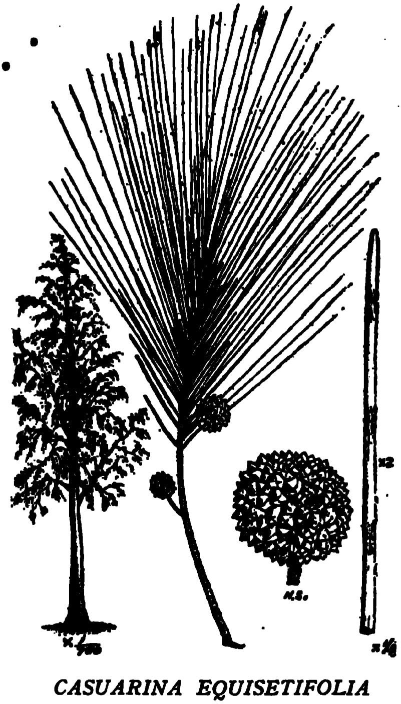
**Casuarina equisetifolia** Forst. *Syn.* C. muricata *Roxb.*
(Equisetifolia means "with leaves like an *Equisetum*, or horse tail".
Muricata means "covered with short sharp points".)

| | |
|---|---|
| Bengali, | *belati jhau.* |
| Hindi, | *jangli jhau, jangli saru, vilayati saru.* |
| English, | *Australian oak, beefwood, she oak, casuarina, tinian pine.* |

F.I. p. 632. F.B.I. Vol. V. p. 598. B.P. Vol. II. p. 985).

A large monoecious tree; branches drooping; branchlets green, very slender, sulcate, drooping in clusters 6 to 8 inches long, with whorls of 6 to 8 scale-like leaves; male flowers in spikes at ends of branchlets, at the base of which the female heads are borne; branchlets and male spikes about 1/20 inch diam.; female heads about ¼ inch long and wide; ripe fruit ¾ inch diam., globose.

This large and handsome tree has drooping branches set with numerous long, slender, pendulous, green twigs mostly borne in clusters near the ends of the branches. In general appearance the tree is reminiscent of a pine, owing to the resemblance of its green twigs to the needle-like leaves of pines, though pine-needles are usually much shorter than the twigs of a casuarina. The minute flowers are very inconspicuous, and the fruit is a small, woody, globular cone. The name of this species is derived from the curious resemblance of the branchlets to the stems of the genus *Equisetum*, the horse tails, which are a very primitive type of marsh plant, once of great importance in the vegetable kingdom, but now represented only by some insignificant herbs of marshy places. When the outer bark is sliced off the inner bark has exactly the appearance of raw meat.



*CASUARINA EQUISETIFOLIA*

This tree is much planted as a roadside tree and in parks and gardens, but it is not well suited for the former purpose owing to its scanty shade, and the tendency of its branches to fall without warning in high winds. However, the soft sighing of the air through its innumerable slender twigs is a pleasant and well-known sound, reminiscent of the noise of the sea washing on a distant shore, and its light, open foliage is a pleasant change from the sombre greens of most tropical trees.

The tree is much planted on the coasts of India to reclaim stretches of sand dunes, and large areas have been afforested in this way in the neighbourhood of Puri and Balasore.

The timber is very hard and tends to crack and split. It is durable and makes good beams, pit-props, and posts, but not planks, and it does not last well underground. The colour of the wood is mostly white, but near the centre it is brown. Its weight is about 60 lb. per cubic foot ; it makes very excellent fuel, and may be cut for this purpose when 10 or 12 years old. The natives of Australia use it to make their war-clubs.

The tree yields a good resin, and the bark is used for tanning as well as for dyeing fishermen's nets.

The bark is astringent, and is employed in the treatment of diarrhoea and dysentery. It is also used as a tonic.

The tree is a native of Australia, Malaya and the Pacific Islands. It is commonly planted in Calcutta.

The flowers appear in the hot weather.

# MUSACEAE

A family of about 10 genera with 80 species of herbaceous plants, some of which attain a great size, all natives of the tropics. The leaves spring from underground stem (rhizomes), their sheaths being rolled round one another forming what looks like an aerial stem or trunk. The leaf itself is large with a stout midrib and parallel veins running from the midrib to the edge. The flowers are hermaphrodite or unisexual, with 6 sepals and petals, 5 stamens, and an ovary below the base of the petals (inferior) containing 3 cells. The fruits take various forms.

This family was considered by early authorities to be part of the large family *Scitamineae*, which comprises, amongst many other genera, *Zingiber*, including *Z. officinale* Rosc., the ginger (Bengali, *ada*) ; and *Canna* including *Canna indica* Linn., the Indian shot (Bengali, *sarba-jaya*), a very common garden plant, much cultivated in Bengal.

**MUSA.** (Named after Antonius Musa, physician to Octavius Augustus, first emperior of Rome, B.C. 63-14.) A genus of about 30 species of tree-like herbs with thick, soft stems composed of leaf-sheaths rolled round one another. The leaves are very large and oblong in shape. The flowers grow in spikes at the end of the stem, the lower flowers being female and the upper male. The sepals are united in a tube split down one side. The petals are short and envelop the 5 stamens and the style. The fruit is fleshy and does not split open to release the seeds (indehiscent).

Several species of this genus are wild in various parts of India, of which one is extensively cultivated in all warm countries and is represented by many varieties.

The genus includes *M. textilis* Nees, the Manilla hemp, which is much cultivated in the Philippines for the fibre contained in its stems, and is occasionally planted in Indian gardens. This is a tall plant up to 22 feet in height, with large leaves, bright green above and glaucous beneath. The fruit is 2 or 3 inches long, curved, filled with black seeds, and not edible.

*M. Cavendishii* Lamb., the Chinese dwarf banana (Hindi, *kabuli kela*), is cultivated fairly extensively in Bengal. It closely resembles *M. Sapientum*, but has a stout thick stem not more than 6 feet high, 6 to 8 leaves from 2 to 3 feet long, and slender, thin-skinned fruits about 4 inches long, borne in large bunches, each comprising as many as 250 fruits. The skins of the fruits are pale green when ripe; the pulp has a delicate flavour but the fruits are difficult to obtain in perfection because they decay very soon after ripening.

**Musa paradisiaca** Linn. *Syn.* Musa Sapientum *L.*
(Paradisiaca means "heavenly". Sapientum is Latin meaning "of the wise men").

| | |
|---|---|
| Bengali, | *kala, kela, keli, kachkela* (the cooking varieties). |
| Hindi, | *kela, amrit, kachkula* (the cooking varieties.) |
| English, | *banana* (the varieties with fruit edible uncooked), *plantain* (in India all varieties, but elsewhere only those varieties which are not edible unless cooked), *Adam's fig, fig of India.* |

(F.I. p. 222. F.B.I. Vol. VI. p. 262. B.P. Vol. II. p. 1050).

A herbaceous tree; pseudostem up to 20 feet high; leaves radially arranged, oblong, 4 to 5 feet long (or much larger in cultivated plants), bright green above, paler beneath, petioled; spike drooping, the lower flowers female, the upper male; bracts large, spathaceous, ovate, many flowered; calyx 5-toothed at the tip, yellowish-white, 1 to 1½ inches long; petals shorter than the calyx, oblong; fruit oblong, sometimes trigonous, tapering to the base and apex, pulpy, yellowish-green or reddish when ripe.

This is a gigantic herb with a thick soft, greenish stem surmounted by a number of very large oblong leaves radially arranged on short stalks, which spring from near the top of the stem. The leaves are bright glossy green above, but paler and satiny beneath; when young their edges are quite unbroken, but as they grow older their margins are split by the wind in many places, which soon makes them appear ragged and tattered. When the tree is about a year or fifteen months old, the flowers appear in a single drooping spike, which emerges from the centre of the crown of the tree. The flowers are unisexual, the males being borne at the end of the spike, more or less enclosed in large purple leaves or "bracts", while the females grow further up the stem in closely crowded rows, also more or less covered by large coloured bracts. The female flowers rapidly develop into the well-known finger-like fruits, which hang in compact tiers above the pendulous mass of male flowers. In the case of cultivated plants the fruits rarely contain seeds, but those of wild plants are full of numerous black seeds, and these may occasionally be found in cultivated fruits also.

A great number of varieties of this very valuable plant are known in cultivation, and to attempt to describe all those found in Bengal would be a formidable task. Sir David Prain who knew the species as *M. Sapientum,* distinguished the following three principal varieties found in the province:—

*Musa Sapientum proper.* A cultivated variety with few or no seeds, and soft, sweet pulp edible when uncooked.

MUSA PARADISIACA

*Musa Sapientum var. paradisiaca* (Paradisiaca means "pertaining to Paradise"). Another cultivated variety with few or no seeds, but with firm pulp only edible when cooked.

*Musa Sapientum var. sylvestris.* (Sylvestris means "wild".) The original wild plant, not exceeding 12 feet in height, with many large seeds and firm pulp.

The wild form of this plant is apparently indigenous in the eastern Himalayas and various other parts of India, including Chota Nagpur and Chittagong, as well as in Malaya, though some think it originated in America. In the plains of Bengal the cultivated varieties are planted everywhere, probably forming the most important fruit-trees of the province, and yielding valuable food for all classes of people. Most of the trees grown belong to the *paradisiaca* group, the fruits of which are only used as vegetables for cooking, or to inferior kinds that can be eaten raw, but are normally only consumed by poor people. A great number of types are grown which yield fruits of very various size, shape and colour. Even the kinds that can be eaten raw are often cooked in curries or roasted, or boiled in cow's milk.

The best dessert varieties require considerable care in cultivation, and the finest fruits are usually only available in Bengal during the monsoon months.

Of the dessert varieties the best known in Bengal are the following:—

*Champa.* This variety has very sweet fruits about six inches long and pale yellow in colour when ripe. The stem is reddish, as also is the central rib of the leaf.

*Chini champa.* This variety is similar to the above, but the fruits are not much larger than a man's thumb.

*Martaban.* This variety has fruits not unlike those of the champa, but with a different flavour. The rib of the leaf is not red, but there is a narrow reddish-brown border at the base of the leaf, and this colour is more pronounced on the sharp upper edges of the stalk.

*Dakai, or dakai-martaban.* The fruits of this plant are distinct in flavour, have a very thick skin, and are only about four inches in length. The red border on the upper edges of the leaf-stalk is three times as broad as in the preceding variety, and there is a quantity of a white powdery substance on the stem and on the undersides of the leaves.

In dryer climates several forms with red fruits, containing very sweet pulp, are often grown, but these are seldom seen in Bengal. The best of these is perhaps that known as *ramkela,* which has rather thin fruits about 7 inches long. The stem, leaf-stalks, the midrib of the leaf, and the flowers are dull red in colour.

Apart from its fruit, the banana has a number of other uses. The ashes of the leaves, the bark, and the skin of the fruit are used in dyeing, and the latter is also employed for tanning and for blackening leather. A substitute for marking-ink can be made from the sap. Fibres taken from the leaf-stalks are used for cordage purposes and for making mats, and parts of the stalks are made into little boxes for holding snuff, drugs, etc. The leaves are much used as plates, as wrapping material, for making mats, and as temporary thatch for huts. Ashes obtained by burning the leaf and leaf-stalk are sometimes employed in place of soap for washing clothes. The flowers are often cooked and eaten, generally in curries, and the central portion of the stem (called "*thor*") is also eaten, generally after boiling. A solution of the ash is used instead of salt in cooking vegetable curries. The shoots and buds of young plants are eaten as vegetables, and are given to cattle and sheep as fodder. The outer sheaths of the stem are a useful food for elephants, and the underground stems are said to be given to cows to increase their yield of milk.

The banana has a great number of medicinal uses. The root is considered a remedy for biliousness, dyspepsia, leprosy, earache, and diseases of the blood. The juice of the stem is thought to cure leprosy, diseases of the ear and of the blood, and is given in cases of hysteria and epilepsy. The flowers are prescribed for bronchitis, consumption, biliousness, dysentery, and ulcers. Children who have had an overdose of opium are sometimes given the juice of the bark and leaves, and the sap is used for the bites and stings of poisonous animals. The young leaves are applied as dressings to burns and blisters, and used as eye-shades in cases of ophthalmia. The ashes of the leaves are employed in acidity and colic, and various parts of the plant are considered useful in the treatment of dysentery and diarrhoea.

Hindus use the plant in various ceremonies, especially as an emblem of fertility and plenty on the occasion of marriages and other happy events, when the leaves and fruits are placed at the doorways of houses. The perennial nature of the plant, with its numerous suckers constantly producing new plants one after another, is likened to a prosperous and prolific human family.

The banana is propagated easily from suckers and grows very quickly, yielding fruit in ten to eighteen months from the time of planting. The plant dies after once fruiting, and must then be cut down and replaced by its suckers. There is an art in regulating the suckers so that a succession of fruit can be achieved without overcrowding the ground, and after five years or so the clump of plants should be moved to fresh soil. The flowers and fruit may be produced throughout the year.

**RAVENALA.** (A vernacular name of Madagascar). A genus of 2 species of tree-like herbs, natives of Madagascar and South America. The leaves are large and close-set at the top of the stem on long stalks, which are arranged in one row so that the leaves form a fan-shaped crown. The numerous flowers grow in several small clusters, each cluster on a short stalk, which springs from near the base of a leaf. The flowers are enclosed in large boat-shaped leaves (bracts), each flower having 3 sepals, 3 petals, and 5 stamens. The fruit is a pod (capsule), which opens by 3 valves to release numerous seeds.

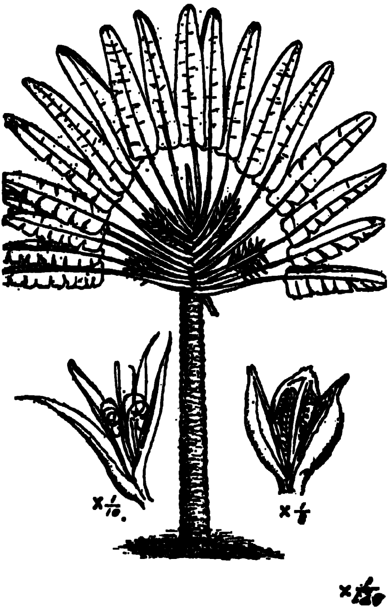
**Ravenala madagascariensis** Sonn.
(Madagascariensis means "of Madagascar").

| | |
|---|---|
| Bengali, | *panthopadop.* |
| English, | *traveller's tree, traveller's palm.* |

(F.B.I. Vol. VI. p. 198. B.P. Vol. II. p. 1050. Not in F.I.).

A herbaceous tree; pseudostem woody, up to 40 feet; leaves distichously close-set, oblong; petiole longer than leaf-blade, with concave base; scapes or peduncles in upper axils; flowers short-pedicelled, shortly racemose within large spathaceous bracts, distichously spreading; sepals 3, narrow, keeled; petals 3, unequal; stamens 5, shorter than petals; carpels 3, connate; fruit an oblong or ovoid-trigonous, loculicidally 3-valved capsule; seeds numerous, blue.

This is an immense herbaceous plant with a fairly hard stem, which in favourable climates attains a height of 40 feet, but in Bengal seldom, if ever, reaches half that height. Its huge leaves are set on stalks longer than themselves near the top of the stem, in one row so that they form a flat fan-shaped head to the tree. They are narrow and smooth, and have the general appearance of plantain leaves, and like plantain leaves are split by the wind as they age, so that the old leaves always have a tattered appearance. The base of the long-leaf stalk is concave and overlaps the stalk of the next leaf above it. The flowers grow in several long, compact clusters, or spikes, each of which is borne on a stalk that springs from the base of one of the upper leaves. Each flower is enclosed in one of several large bracts, which are set in two opposite rows on either side of the central stalk; and each has three unequal sepals, three unequal petals, five stamens, and one style. The fruit is a pointed three-cornered capsule, which opens by three valves to release a number of seeds surrounded by a mass of bright blue or purple fibre.



*RAVENALA MADAGASCARIENSIS*

A quantity of clear, watery sap is always to be found in the hollow, sheathing leaf-stalks, and can be tapped by simply piercing the base of the leaf-stalk with a sharp stick, when a jet of pure drinking water is immediately obtained. This may be of great value to travellers in the plant's native jungles,—hence the English names of the tree.

Madagascar is the habitat of this plant, but it is now planted in many tropical countries for ornament and as a curiosity. A specimen may be seen (in 1942) in the garden at Belvedere and others may be found in several Calcutta gardens.

The tree lives for a number of years, gradually increasing in height and shedding its lower leaves as they age and die. The trunk is marked with the scars of the fallen leaves. The flowers appear towards the end of the rains, but fruits are seldom produced in the climate of Bengal.

## PANDANACEAE

A family of 3 genera with about 225 species of trees and shrubs with tall stems often supported by aerial roots, as if standing on stilts. The leaves are leathery and very narrow with thorny margins; they have no stalks, but have sheaths at their base, which are joined to the stem in 3 vertical, spirally twisted rows. The flowers are small and unisexual, the 2 sexes being borne on separate trees (dioecious). Both male and female flowers grow in compact clusters, which are covered with leafy sheaths (spathes), and arranged in spikes. The flowers have neither sepals nor petals, but the stamens of the male flowers are very numerous. The fruit is composite, consisting of many small fruits combined into a compact whole (syncarpium).

The plants are mostly sea-coast or marsh plants, and are all natives of tropical Africa and Asia.

**PANDANUS.** (A latinized form of a Malayan vernacular name). A genus including about 150 species, of which about 5 are found in India. The genus is distinguished by the absence of barren stamens (staminodes) in the female flowers, and by each individual fruit containing a single seed. The plants are all erect or procumbent, and are never climbers.

In addition to the tall plant described below, *P. foetidus* Roxb. (Bengali, *keiya kanta,* or *kotki kanta*) is common near Calcutta, chiefly grown as a hedge plant in villages. This is a bush with no proper stem, leaves 4 to 6 feet long, and evil-smelling flowers. A number of other species, mostly shrubs of moderate size, are sometimes grown in Indian gardens.

**Pandanus tectorius** Soland. *Syn.* P. fascicularis *Lam.*
P. odoratissimus *Roxb.*

(Tectorius is Latin meaning "used for thatching", Fascicularis means "in close clusters", in allusion to the flowers. Odoratissimus means "very sweet-scented").

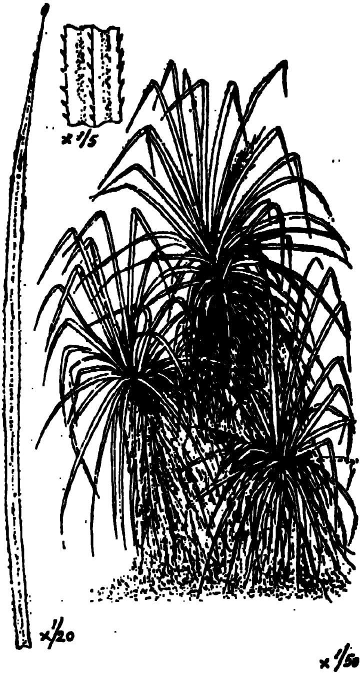
| | |
|---|---|
| Bengali, | *keiya, keori, kea, ketkikeya, ketuki.* |
| Hindi, | *gagandhul, keora, ketgi, keura.* |
| English, | *screw-pine, umbrella tree, Nicobar bread-fruit.* |

(F.I. p. 707. F.B.I. Vol. VI. p. 485. B.P. Vol. II. p. 1101.)

A tall, gregarious, dioecious shrub, or small tree; stem much branched, rarely erect, up to 25 feet high, resting on aerial roots; leaves ensiform, caudate-acuminate, coriaceous, spinous on edges and midrib, 3 to 5 feet long, glaucous-green, in tristichous spirals; male spadix with numerous subsessile cylindric spikes up to 4 inches long, enclosed in long white fragrant membranous spathes; staminal column ¼ to ½ inch long, female spadix solitary, 2 inches diam.; carpels confluent, stigmas short,

**reniform, yellow; staminodes 0; fruit an oblong or globose syncarpium, 6 to 10 inches long, yellow or red when ripe, drooping; drupes numerous, each consisting of 5 to 12 carpels.**

This is a tall evergreen shrub or a small tree, with a smooth, light brown stem, which is usually much branched, is seldom erect, and always rests on a number of stiff aerial roots, which rise several feet above the surface of the ground. The long, sword-shaped leaves are set in three spirally twisted rows on the tops of the stem; they are smooth, hard, and leathery, with spines along their edges and midribs; their colour is a greyish-green and they have no stalks, being attached directly to the trunk by the sheathlike, stem-clasping base, from which they taper gradually to a fine, drooping point. The minute flowers are unisexual, the two sexes being found on separate trees in very differently arranged clusters; the male flowers, which grow in dense clusters at the ends of branches, consists of no more than masses of stamens arranged in slender branching spikes, each branch being enclosed in a narrow, pointed, white leaf, or "spathe"; but the female flowers grow in solitary dense clusters protected by whitish leaves like those surrounding the male flowers. From each cluster of female flowers numerous minute fruits develop into a single large composite fruit, oblong or spherical in shape, and yellow or red when ripe, with a strong resemblance to a pineapple.



*PANDANUS TECTORIUS*

This plant is very distinctive, not only because of the curious way in which its stems are supported on numerous slender roots, but owing to the arrangement of its narrow drooping leaves in compact spirals at the tops of the stems, which has given the plants of this genus their usual English name of screw-pines. This species is the commonest of the genus, and is abundant on the sandy coasts of India and Burma, often forming dense impenetrable thickets in tidal forests. Inland it is grown as a hedge plant (though too large to be very suitable for this purpose), and in gardens for the strong fragrance of its flowers, which are perhaps the most highly scented blooms to be found in the world. It is not uncommon in Calcutta gardens, and in the surrounding countryside. A clump of these plants may be seen (in 1942) near the Royal Calcutta Golf Club's pavilions on the Maidan. A variety with variegated leaves is sometimes grown in gardens.

The leaves yield a strong white fibre, which is collected for making cordage, matting, and sometimes sacks. The roots are also fibrous and are used for binding baskets ; they are sometimes cut into lengths, beaten out, and employed as brushes for painting and white-washing, and are also used as a substitute for cork. The tender floral leaves are eaten, raw or cooked, and the pulp obtained from the interior of the fruit is also eaten, but usually only in times of scarcity. A scented water known as *keorha* is prepared from the flowers, which are also in great request for scenting catechu to be chewed with *pan*. The fruit is used for hackling thread. The wood is fairly hard outside, but very soft within, and almost useless.

Medicinally the leaves are believed to be valuable in leprosy, small pox, scabies, and diseases of the heart and brain. The anthers of the male flowers are given in earache, headache, and diseases of the blood. An oil obtained from the floral leaves is prescribed for headache and rheumatism, and to cool and strengthen the brain.

The fragrant flowers are much esteemed, and may often be seen on sale at railway stations and elsewhere. Women wear them in their hair and they are much used as offerings in temples, particularly in connection with the worship of Shiva. They appear in the month of July, and the fruits ripen in the following hot season.

Scratches from the sharp spines with which the leaves are armed should be carefully avoided because they are apt to become septic.

## PALMAE

**The palms are a large family—comprising about 130 genera and 1,100 species, all natives of the warmer countries of the world. The economic importance of the family in the tropics is great, for the**

palms are capable of furnishing to mankind most of the necessities and some of the luxuries of life, and form perhaps the most characteristic feature of the vegetation of hot countries. The appearance of palms is usually distinctive owing to the unbranched stem crowned by a cluster of large leaves, though a few species (not usually found in Bengal) have branched stems. A few other plants can be confused with palms, but among trees found in lower Bengal probably only *Cycas Rumphii* (see below) can be wrongly taken for a member of this family.

The leaves are usually very large, sometimes gigantic, and usually much exceed in size those of all other plants. In some species the leaves (with their stalks) attain as much as 50 feet in length and 8 feet in width. They are usually divided into segments or leaflets, and the manner of their division forms a useful guide to the classification of the family. The leaf-stalk is usually large and stout, with a strong base covered by a sheath. The lower leaves fall as they grow old, often leaving on the trunk their stumps, which persist for some time. In some cases the sheath also remains, leaving as it decays a dense covering of fibres round the base of the younger leaves. The flowers are not large, and are borne in clusters, which may be small and compact, but may reach a vast size; in the case of the genus *Corypha* the inflorescence sometimes attains 30 feet in height. The clusters are at first enclosed in large sheaths, or "spathes". The flowers may be bisexual, or unisexual in which case the two sexes may be borne on the same or on separate trees. There are usually 3 dry or leathery sepals, 3 dry or leathery petals, and 3 or 6 (or occasionally more) stamens. The ovary consists of 3 divisions (carpels), which may be separate or combined. The fruits are generally berries, and small in comparison with the size of the plants, but are occasionally large and woody, as in the case of the coconut; they usually contain either one or three seeds. The young plants generally have leaves which bear little resemblance to the foliage of the adult trees. As well as trees and shrubs the family includes climbers, some of which attain to an enormous size and, being heavily armed with thorns, form an almost impenetrable obstacle in the jungles where they abound. One climber, *Calamus viminalis* Willd., the rattan cane (Bengali, *bara bent*), is not uncommon in village shrubberies near Calcutta.

**PHOENIX.** (From the Greek, meaning "purple" in allusion to the fruit). A genus of about 11 species of trees or shrubs, natives of Africa and Asia, distinguished by pinnate leaves (i.e. leaves divided into separate leaflets arranged in two rows on either side of a central midrib), with folded leaflets which have no central midrib. The flowers are unisexual and the two sexes are found on different trees. The ovary consists of 3 separate divisions (carpels), of which only one matures into a fruit. About 10 species are found in India, including *Phoenix dactylifera* Linn., the date palm, which is of great importance as a source of food in some parts of the East, but is seldom, if ever, to be seen in Bengal.

**Phoenix sylvestris** Roxb.

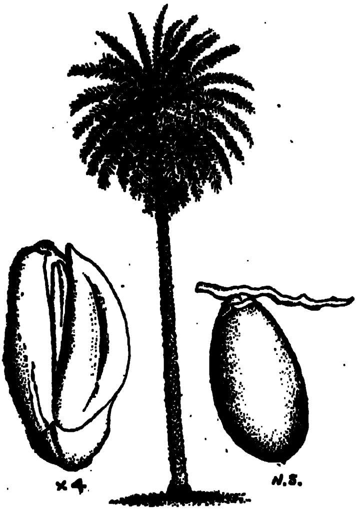
(Sylvestris in Latin means "wild").

| | |
|---|---|
| Bengali, | *khajur, kejur, kajar.* |
| Hindi, | *khajuri, khaji, salma, thakil, sendhi, thalma.* |
| English, | *wild date palm, sugar palm, date-sugar palm, Indian wine palm.* |

(F.I. p. 723. F.B.I. Vol. VI. p. 425. B.P. Vol. II. p. 1096).

A dioecious tree attaining 40 feet; leaves 5 to 12 feet long, pinnate; leaflets 6 to 18 inches long by ¾ to 1 inch wide, spinous at tip; lower leaflets transformed into spines 4 inches long; fascicles of leaflets up to 3 inches apart, in several planes; male flowers white, scented, in a compact spadix on a short, flattened peduncle; female flowers on a peduncle 2 feet long or more, terminating in large fascicles of spikes; spathe thick, almost woody; drupe about 1 inch long, flesh sweet but scanty, stone ¾ inch long.

If not injured by the attentions of toddy-cutter, this is a tall and handsome palm, but unfortunately it is usually seen in a deformed and stunted condition. Its trunk, when not damaged, attains a height of 40 feet and is covered with the stumps of old leaf-stalks, but the cuts made in the trunk by those who collect the juice of the tree generally result in a crooked, short trunk, devoid of its normal covering, and marked with deep notches. The leaves are borne in a dense crown at the summit, and are more numerous than those of most other palms, the outer leaves drooping gracefully, and the inner standing almost erect. The leaflets are many, dark green in colour, and tipped with a more or less sharp spine, those of young plants, and those at the base of the leaf, being particularly formidable. The male or female flowers are borne on separate trees in clusters below the leaves. The scented, white male flowers are in compact bunches on short, flat stalks, while the female flowers grow in larger and more open clusters on longer stalks. The small fruits are yellow or reddish-brown when ripe ; they are produced in dense clusters of narrow spikes at the ends of broad, drooping stalks, each berry containing a single large seed in a small quantity of sweetish pulp.



*PHOENIX SYLVESTRIS*

This palm is of considerable economic importance in some parts of India owing to the sugar that is obtained by refining the *gur* or treacle, which is prepared by boiling the juice of the tree. In Bengal, however, most of the juice nowadays seems to be converted into *tari*, or toddy, and for this purpose nearly all the trees found growing in the countryside are utilised, with the result that an undamaged specimen of the palm can only rarely be seen except in Calcutta gardens. The juice is obtained by removing some of the lower leaves and making a deep wedge-shaped cut in the trunk, from which the sap exudes and is conducted by means of a small piece of bamboo fixed at the base of the cut, into a pot that is hung from the trunk to receive the juice. All the trees used for this purpose are licensed by Government and bear a small metal label to show that the tax has been paid.

The leaves are used for making mats, baskets, bags, brooms, and fans. The leaf-stalks are beaten and twisted into ropes to be employed in drawing water from wells. A soft fibre can be obtained from the leaves. The fruit is very inferior as a food for man, but is eaten by the poor in times of scarcity.

The fruit is considered a remedy for heart disease, fevers, abdominal complaints, and insanity, and, mixed with a number of other ingredients, is much used as a tonic and restorative. The root is given to cure toothache.

The wood is used for building, water-pipes, and other purposes. It weighs about 39 lb. per cubic foot.

The tree is indigenous in many parts of India. It forms dense jungles in some places, and is cultivated extensively in others. It is very common in lower Bengal, where it is one of the most typical objects of the countryside.

The flowers appear in the hot season and the fruits ripen in September and October. In June the female trees are conspicuous owing to the many bright orange clusters of berries hanging below the leaves.

**CORYPHA.** (From the Greek "koruphe", a head, or summit, presumably in allusion to the strange inflorescence). A genus of about 6 species of large palms, natives of tropical Asia, which die after once ripening their seeds. Their immense fan-shaped leaves have numerous segments, and are borne on long stalks with spinous edges. Their stout trunks are marked with horizontal rings, and are often clothed for some distance below the summit with the brown stumps of old leaf-stalks that have died and broken off just above the base. Some time after a tree has reached maturity, the leaves gradually begin to decrease in size and in the length of their stalks, until the flowering stage of the tree is reached. The remaining leaves then droop wearily downwards, as if not to interfere with the grand spectacle that is about to appear above them, and a huge inflorescence grows upwards from the top of the trunk, at first enclosed in large sheaths, or "spathes". In some species the flowering panicle may exceed the length of the whole trunk and may measure as much as thirty feet. When the outer spathes first open under pressure from the expanding branches within, they burst with a loud report, which is said to be audible at a great distance. The small greenish or yellowish flowers are densely clustered on the numerous branches of the inflorescence, and are at first included in many small spathes, which cover the young buds and are themselves included in the outer spathes. Each flower has 3 minute sepals, 3 large petals, and 6 stamens surrounding a short style. The ovary consists of 3 carpels, of which only 1 develops to form the almost spherical fruit, which is fleshy in texture, and contains a single large seed within a layer of soft pulp. As soon as the fruits have ripened the leaves die and the trunk stands bare and lifeless, crowned by the many branches of the fruiting inflorescence.

The life of these palms seems normally to be from 30 to 40 years. The flowers appear during the hot season, and the fruits ripen nearly a year after the flowers first open.

The identification of the 3 species of this genus that may be found in Bengal is not easy, but the following key will probably enable them to be distinguished:—

A. Trunk stout without any conspicuous spiral groove or marking; leaf-stalks not much, if at all, longer than the blade of the leaf, more than 2 inches wide at the narrowest part; fruits more than 1 inch in diameter, (as large as a crab apple).

B. Trunk ultimately 50 feet high or more; leaf-stalks green, spines less than ½ inch long; leaf-blades roughly semi-circular in outline (ignoring the narrow segments); primary branches of the inflorescence coming from fissures in the backs of their respective spathes. *Corypha umbraculifera.*

B. Trunk not exceeding 35 feet in height; leaf-stalks somewhat brownish or yellowish, spines more than ½ inch long; leaf-blades (ignoring the narrow segments) almost circular in outline; primary branches of the inflorescence coming from the mouths of their respective spathes. *Corypha Taliera.*

A. Trunk 40 to 60 feet high, rather slender, marked with a conspicuous spiral furrow or marking which gives the trunk a twisted appearance; leaf-stalks much longer than the blades of the leaf, not more than 2 inches wide at the narrowest part; fruits not exceeding 1 inch in diameter, (about the size of a cherry). *Corypha elata.*

**Corypha umbraculifera** Linn.

(Umbraculifera is Latin meaning "shaped like an open umbrella" in allusion to the leaves).

| | |
|---|---|
| Sanskrit, | *tali, sritalam.* |
| Bengali, | *tali, tara, tarit, tallier, bajar batul.* |
| English, | *talipot palm* (of Ceylon), *fan palm* (of South India). |

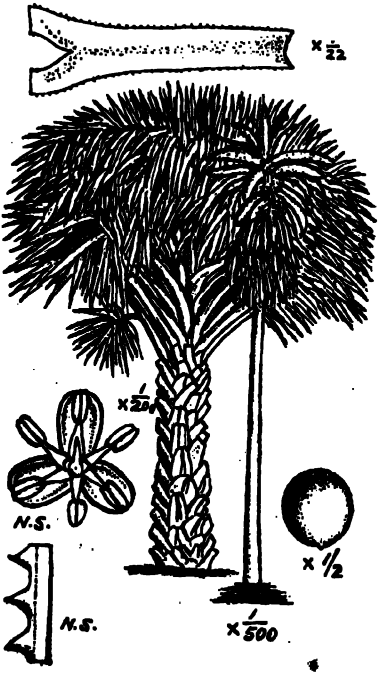
The vernacular names have been much confused with those of other species of the genus, and also with those of *Borassus flabellifer* Linn., the palmyra.

(F.I. p. 299. F.B.I. Vol. VI. p. 428. B.P. Vol. II. p. 1090).

Trunk stout and straight, attaining 80 feet in height and 2½ feet in thickness in more favourable climates, but in Bengal usually not more than 60 feet by 1½ feet; marked with numerous horizontal rings but without any conspicuous spiral marking. Leaf-stalks green, stout, in adult trees more than 2 inches wide at the narrowest part, about the same length as the blade of the leaf or shorter; armed on the upper margins with many small spines or teeth less than ½ inch long. Leaf-blades roughly semicircular in outline, 6 to 12 feet wide (in an adult tree), divided half way to the middle of the leaf into 80 to 100 segments, which are about 4½ inches wide at the base and tapen gradually towards their points. Inflorescence with many spathes, pyramidal, 10 to 20 feet high, on a short stout stalk the primary branches of which pass through fissures in the backs of their respective spathes. Flowers small, greenish-white, clustered in rather slender curved spikes; calyx scarcely 1/25 inch long; petals about 1/12 inch long, elliptic-oblong; filaments ovate, subulate, anthers obtuse; ovary somewhat suddenly narrowed into a rather slender style which in full-grown buds attains the level of the apices of the anthers; stigma punctiform. Fruit subglobose, about 1½ inches diameter, rather rough, greyish-green, one-seeded.

This tree may be easily distinguished, when mature, from its near relatives by its stout green leaf-stalks armed with small spines.

less than ½ inch long, and by its tall trunk with little or no trace of any spiral marking. The semicircular shape of the leaves is also distinctive, but this is not easy to see in the case of a tall tree, though it is a useful means of distinguishing a young plant.



*CORYPHA UMBRACULIFERA*

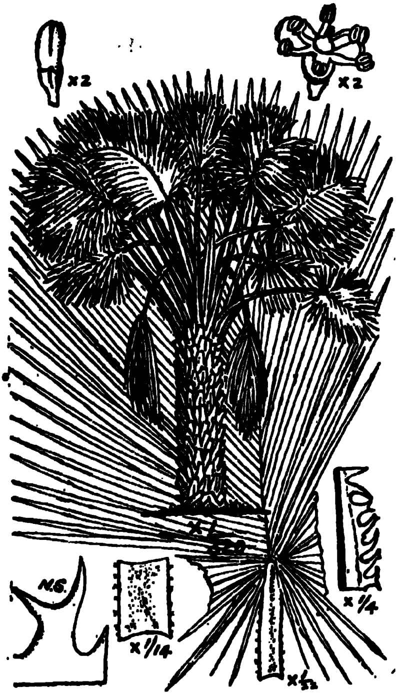
The talipot palm is much cultivated in many parts of south India and Ceylon, and is believed to be indigenous in north Kanara, where it is very abundant. It is the most handsome of the three coryphas found in India, and is often planted in large gardens and parks, sometimes in double rows to form avenues. In Bengal it seems to have been more common formerly than it now is, but to-day it is certainly rare in the province, and may perhaps no longer exist outside the Royal Botanic Garden and the Eden Garden, Calcutta, where fortunately a number of specimens may still be found. Until recently a few others grew in various parts of Calcutta, but the last one known to the writer, a young tree about twelve years old growing near Alipore Police Station, was cut down in 1942. It is much to be hoped that others will be planted where space can be found for them in large gardens.

In places where the talipot palm is common it has very considerable economic importance. The leaves are made into fans, mats, umbrellas, and portable tents, and strips from them are used for writing on as a substitute for paper. An old author quoted by Sir George Watt in his Dictionary of the Economic Products of India writes as follows:—"The leaf, being dried, is very strong and limber, and most wonderfully made for man's convenience to carry along with him; for though the leaf be thus broad (to cover 15 or 20 men), when 'tis open it will fold close like a lady's fan, and then it is no bigger than a man's arm; it is wonderfully light". The strips used for writing purposes are called "olas" and are made by first removing the ribs or nerves of the leaf, and then boiling the remaining strips in water, after which they are dried and polished by friction against a wooden plank. From the pith of the trunk a kind of edible sago is obtained, from which a food like bread is made. The seeds closely resemble ivory in texture and a large trade is, or used to be, carried on from the west of India and Ceylon, mostly by Arabs. They are used for making buttons, small carved ornaments, and beads, and they are sometimes coloured for sale as pieces of coral. Their name in the trade is "bazarbatu nuts" or "bayurbatum nuts". It is said that apart from a tendency to become discoloured with age, these seeds are in every way as good as ivory for making small carved articles. In the west of India the seeds are also said to be used for stupefying fish, for which purpose they are pounded and thrown into ponds or tanks so that the half-poisoned fish may come to the surface and be caught.

**Corypha Taliera** Roxb.
(Taliera is a latinized form of a Bengali name).
Bengali, *tara, tallier, tarit.*
(F.I. p. 298. F.B.I. Vol. VI. p. 428. B.P. Vol. II. p. 1091.)

Trunk very stout and straight, attaining 30 feet in height and 2 feet or more in thickness, marked with numerous impressions of fallen leaves but without any conspicuous spiral marking. Leaf-stalks brownish or yellowish, stout, in adult trees more than 2 inches wide at the narrowest point, about the same length as the blade of the leaf, armed on the upper margins with black spines more than ½ inch long. Leaf-blades almost circular in outline (owing to the edges almost meeting near the stalk), 8 to 12 feet wide, or even wider, divided less than half way from the margin to the centre of the leaf into 80 tapering segments which are about 4 inches wide at the base. Inflorescence a diffuse oval panicle, 20 feet high or more, making the total height of the tree about 50 feet. Primary branches of the inflorescence ascending through the mouths of the broad spathes. Flowers small, whitish, clustered in numerous curved spikes, odorous; calyx minute; petals 3, oblong, concave, fleshy, many times longer than the calyx; anthers oblong-elliptical, obtuse or emarginate; ovary turbinate, almost truncate at apex and not gradually narrowed into the style; style as long as the ovary, subulate. Fruit subglobose, wrinkled and dark greenish-yellow when ripe, sometimes joined to one or two other fruits, which are often rudimentary. Seed solitary, spherical, white and horny.

This palm, although not nearly as stately as the other two species, is certainly the most extremely specialised of the three, and is undoubtedly one of the most remarkable plants to be found in the whole world. It may easily be distinguished when mature from the talipot palm by the brownish colour of its leaf-stalks and by the large black spines with which they are beset, and when young by the nearly circular outline of the leaves. From *Corypha elata* it may be known by the great thickness of its trunk, the size of its leaves, and the stoutness of its leaf-stalks. In the flowering stage it may be recognised at once by the shortness of its trunk (only about 30 feet), and by the great relative size of the inflorescence, which approaches the height of the trunk itself.



*CORYPHA TALIERA*

All writers agree in saying that Bengal is the original habitat of this tree, but no record seems to exist of it having been found wild anywhere. At the beginning of the 19th century it appears to have been not uncommon under cultivation in Bengal, and the leaves were known to be used as writing material in the same way as those of the talipot palm are used to this day in the south of India. The existence of Bengali names for the plant confirms that it was once by no means rare in the province. Even within living memory several specimens were to be found in various Calcutta gardens ; but it seems that in recent years exotic palms, having more graceful outlines and occupying less space, have supplanted this Bengali tree in its own country, with the result that in the year 1943 the writer is not able to trace a single specimen outside the Royal Botanic Garden ; and there the species is represented by only a single mature tree and perhaps a few seedlings. It is sad to think that an unlucky storm might deprive Bengal of what is perhaps the only tree strictly peculiar to the province, and the world of one of its grandest and most curious plants. It is much to be hoped that when the sole survivor in the garden bears fruit, an effort will be made to increase the numbers of this nearly extinct palm.

Although this tree scarcely qualifies for inclusion in this book, it has been fully described in the hope that specimens still exist in Bengal gardens, and that if their rarity is realised, they may be preserved and their kind perpetuated.

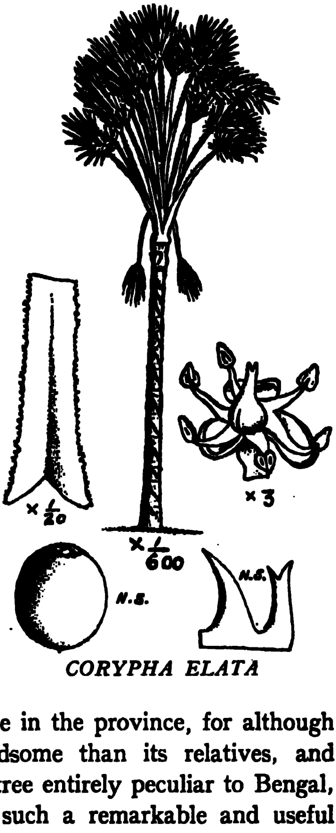
**Corypha elata** Roxb.
(Elata is Latin meaning "tall").
Bengali, *bajur, bajurbatul.*
(F.I. p. 298. F.B.I. Vol. VI. p. 428. B.P. Vol. II. p. 1091).

Trunk straight, 60 to 70 feet by about 1½ to 2 feet thick, marked with rings, and a conspicuous spiral furrow caused by the spiral arrangement of the leaves, which gives the whole trunk the appearance of being twisted. Leaf-stalks slender, less than 2 inches wide at the narrowest part, much longer than the blade of the leaf, mostly ascending except when the tree is about to flower, armed with numerous black curved spines on the upper margins. Leaf-blades more or less circular in outline, about 8 feet wide, divided about half way from the margin to the centre of the leaf into 80 to 100 segments, which taper little and end in a blunt point divided into two lobes. Inflorescence compact, about 15 to 20 feet high, with innumerable smooth, pale yellow ramifications. Flowers small, pale yellow, in dense clusters; calyx three-toothed; petals 3, oblong, reflexed; ovary subglobose, faintly 3-lobed, conical in its upper part and (somewhat suddenly) narrowed into a slender style which attains the level of the anthers in the unexpanded flower; stigmas 3, distinct, punctiform; anthers ovate-cordate, obtusely apiculate. Fruit globose, the size of a large marble, olive-coloured, smooth when fresh but soon becoming dry and wrinkled, one-seeded.

This palm, though very handsome when a young plant, becomes rather untidy as it matures owing to the leaves getting damaged by the wind, and is perhaps the least desirable of the genus as a garden plant. It may be known from the other species by its slender leaf-stalks, and by the very noticeable spiral marking of its trunk, which may be clearly seen even when the trunk is covered with the dead bases of old leaves. When the tree reaches the flowering stage, the comparatively small inflorescence (which is not more than a fourth the height of the whole tree), and the small fruits, are also distinctive.

As in the case of *Corypha Taliera,* all the authorities agree in saying that this tree is a native of Bengal, though there seems to be no record of it even having been actually found growing wild in the province. Very similar palms are found in the Philippines, the Cocos Islands, Burma and in the Andamans. Some botanists have given these separate specific names, but it now seems probable that they must all be regarded as the same species. It has been suggested that the wide distribution of this plant is due to the activities of fruit-eating bats (flying foxes), which are very fond of its fruits and undoubtedly help to disperse the seeds.

In former times this fine palm seems to have been much more commonly grown in Bengal than it is at present, though apparently it has never been cultivated in other parts of India. The existence of a Bengali name shows that it was once well known to the people of the province, and it is recorded that it was once used for most of the purposes to which the talipot palm is put to this day in places where it is plentiful. The writer has seen two specimens flower and die in or near Calcutta in recent years, but there are now few survivors to succeed them. In fact, he knows of none outside the Royal Botanic Garden, except some young plants in the shrubbery at the east end of the Zoo. It is to be hoped that others are still to be found elsewhere in the province, for although this tree is less striking and handsome than its relatives, and although it cannot be claimed as a tree entirely peculiar to Bengal, it would be a great pity to allow such a remarkable and useful plant to become more rare than it now is.



CORYPHA ELATA

**LIVISTONA.** (Named in honour of Lord Livistone, the founder of the Edinburgh Botanic Garden). A genus of fan-leaved, erect palms, usually lofty, but with slender trunks. The leaves are divided to some distance from the outside of the leaf into numerous narrow, pointed leaflets, which are more or less notched or split at the apex. The leaf-stalks are long and slender. The small flowers are bisexual; they have 3 rounded sepals, 3 leathery petals joined at the base, 6 stamens, an ovary divided into 3 spherical divisions (carpels), and 3 short styles. The fruit consists of from 1 to 3 small fleshy berries.

The genus consists of about 24 species, natives of tropical Asia, the Pacific Islands and Australia. Of these two species are commonly planted in Calcutta parks and gardens, in addition to which several others are occasionally cultivated in India, and another is indigenous in Assam.

**Livistona chinensis** R. Brown. *Syn.* L. mauritiana *Watt.*
(Chinensis means "of China").
English, *China palm* (in Europe).
(F.B.I. Vol. VI. p. 434. B.P. Vol. II. p. 1092. Not in F.I.).

Trunk up to 50 feet, usually about 30 feet; leaves flabellate, deeply divided into linear-lanceolate, acuminate segments, which are divided again into two drooping parts; leaves about 4 feet diam.; drooping segments about 1 foot long; petiole 4 feet long or more, slightly spinous; flowers hermaphrodite, greenish; drupe ellipsoid or ovoid, about 1 inch long, bluish-green when ripe.

This is a palm of moderate height with a rather stout greyish stem, and fan-shaped leaves, easily distinguished from all others by their narrow pointed segments, which are split lengthways for about 12 inches from the point, the split portions drooping and giving the palm an altogether distinctive appearance. Many small greenish flowers are borne in rather large clusters, which are divided into several distinct parts. The fruit is smooth, of about the same size and shape as an olive, and bluish-green when ripe.

$\times\frac{1}{125}$

*LIVISTONA CHINENSIS*

This handsome palm is a native of southern China. It is widely cultivated in many parts of the world as an ornamental tree, and is grown in the south of England. It is commonly planted in Calcutta.

Fans are sometimes made from the leaves, and the fibre obtained from the leaf-stalks is used for rope-making.

The flowers are produced from April to June.

**Livistona rotundifolia** Mart.
(Rotundifolia is Latin meaning "with round leaves".)

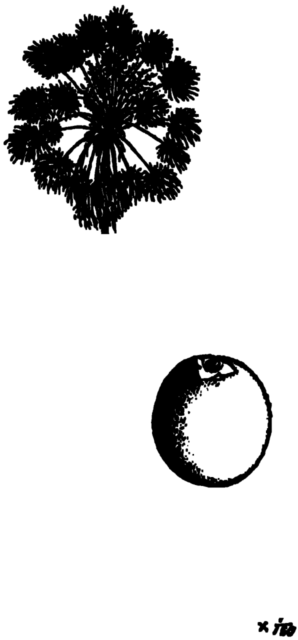
English, *China palm* (in India).

(Not in F.I., F.B.I. and B.P.).

Trunk up to 50 feet high, 1 to 1½ feet diam., brownish black; leaves flabellate, 3 to 5 feet diam., suborbicular; segments 60 to 90, connate for ⅓ their length, bifid for about 6 inches; petiole about twice the length of the blade, armed with recurved spines; flowers small, globose, yellow, in 3 spadices enclosed in 1 spathe; calyx and corolla tripartite; filaments broadened at the base; styles connate; fruiting peduncles about 4 feet long; drupe depressed-globose, ¾ inch diam., violet or black when ripe.

This is a very graceful palm with a tall, straight, slender stem, and round, bright green leaves borne on the ends of slender, spinous stalks, which are about twice as long as the blade of the leaf. The segments of the leaf are rather short and do not droop downwards, but stand out stiffly in the same plane as the undivided part of the leaf. The small yellowish flowers are borne during the hot season, in numerous long branching clusters among the bases of the leaf-stalks, and are followed by large numbers of smooth spherical berries which turn a bright reddish orange in the month of July, and finally nearly black when ripe.

This palm is a native of the Philippines and Malaya. It is fairly common in the gardens of Calcutta and is certainly one of the most handsome palms cultivated in India.



*LIVISTONA ROTUNDIFOLIA*

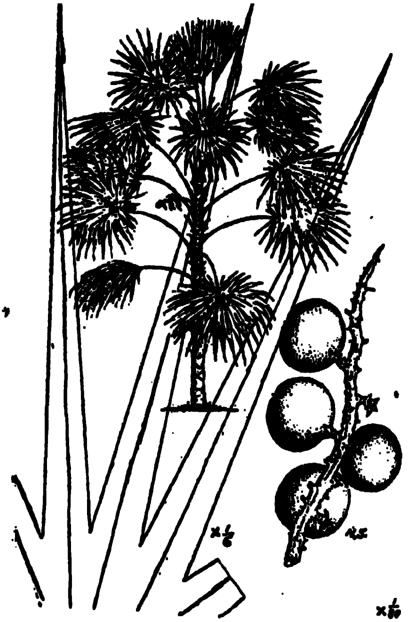
**THRINAX.** (From the Greek "thrinax," a fan.) A genus of about 30 species of erect, spineless palms with fan-shaped leaves. The members of this genus may usually be known by the base of the leaf-stalks being enveloped in a brown fibrous network. The palms are of moderate height, and girth. Their leaves are divided into more or less deep segments, and are much plaited near the centre where they are attached to the stalk. The small bisexual flowers are borne in clusters below the leaves, and have the calyx and corolla combined to form a 6-toothed cup. The fruits are small drupes containing a single seed. These palms are native of the West Indies. Several species are occasionally cultivated in India, but only one is commonly seen in Calcutta.

**Thrinax barbadensis** Lodd. *Syn.* Coccothrinax barbadensis *Becc.*
(Barbadensis means "from Barbados").

(Not in F.I., F.B.I., and B.P.).

Stem up to 50 ft. high by about 7 inches diam.; leaves palmatifid, glabrous; blade 3 to 4 feet diam., green on both surfaces; segments rather short, united about half way to the base; petiole about as long as the blade, compressed-convex on both sides, covered at the base with a fibrous network; spadix 10 to 20 inches long, consisting of 4 to 10 radial panicles on a common axis; flowers hermaphrodite, whitish, scented; stamens 8 to 12; filaments subulate, united at the base; style stout, shorter than ovary; fruit globose, pulpy, polished, about ¼ inch diam., purple when ripe.

This is an erect, graceful palm of moderate size, with fan-shaped leaves divided into numerous pointed segments round the edges. The leaves are uniformly green on both surfaces, by which characteristic this species may be known from others of the genus, most of which have leaves more or less silvery or yellow on the lower surface. The slender, spineless leaf-stalks are about the same length as the blades of the leaves, and are covered at the base with a brown, fibrous network reminiscent of coarse cloth. The leaf-stalks are not tightly clustered at the top of the trunk, but are arranged at intervals for some distance from the summit. Many minute yellowish flowers are borne on rather slender stalks in branching clusters which spring from the bases of the leaf-stalks. They have a strong scent which is very attractive to bees. The fruit is a small berry about the size of a pea, purple when ripe, containing a single seed.



*THRINAX BARBADENSIS*

This palm is a native of the smaller Antilles. It is occasionally planted in Calcutta gardens.

The flowers appear during the hot weather and the fruits ripen nearly a year later.

**BORASSUS.** (From a Greek word meaning some part of a palm tree.) A genus consisting of 7 species of tall, fan-leaved palms, natives of Africa, India, Malaya and Australia. The edges of the leaves are divided into numerous pointed and folded segments, and the leaf-stalks are armed with spines. The flowers are unisexual and the two sexes are found on separate trees. The male flowers are very small and are clustered in cavities sunk in the flowering branches (or "spadix"); each male flower has 6 stamens. The female flowers are solitary and much bigger than the males. The fruits are large and more or less spherical.

**Borassus flabellifer** Linn. *Syn.* B. flabelliformis *Roxb.*
(Flabellifer means "bearing fans". Flabelliformis means "fan-shaped").

| | |
|---|---|
| Bengali, | *tal, tal gachh.* |
| Hindi, | *tal, tar, tarkajhar.* |

| | |
|---|---|
| Urdu, | *tad.* |
| English, | *palmyra palm, toddy palm* (in Bengal), *brab tree* (in Bombay), *fan palm, desert palm, char palm.* |

(F.I. p. 724. F.B.I. Vol. VI. p. 482. B.P. Vol. II. p. 1092.)

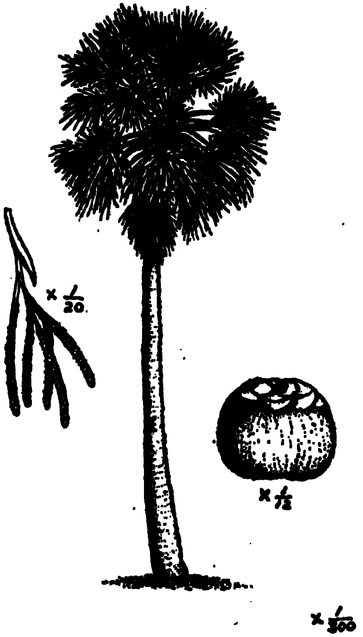
Trunk up to 100 feet (usually not more than 60 feet in Bengal), and 2 feet diam. near ground; base with a dense mass of rootlets; leaves flabelliform, 3 to 5 feet diam., segments 60 to 80, shining, linear-lanceolate; petiole 2 to 4 feet long, edges with horny spines; flowers dioecious; spadix simply branched; male flowers minute, mixed with scaly bracteoles, sunk in cavities between imbricate truncate bracts, in narrow spikes 9 to 15 inches long; female flowers 1 inch diam., globose, scattered singly on a sparingly branched spadix; fruit a drupe, trigonous when young, at length almost globose, 6 inches diam.

This is a tall palm with a thick, dark-coloured trunk, and large fan-shaped, shining, greyish-green leaves on stout stalks that are shorter than the leaves themselves. The male trees have very numerous flowers tightly collected in compact, branching spikes, which are grouped among the leaves or below them : the flowers grow in small clusters, mixed with scales and sunk in cavities between large overlapping leaves, or "bracts", which cover the stout flowering branches. The female trees bear larger flowers scattered in sparingly branched clusters. At first the large fruits have three distinct angles, but later they become almost entirely spherical; they contain three hollow seeds composed of white, fleshy pulp, which hardens as the seeds mature.

This very common palm, owing to its large fan-shaped leaves, can only be confused in Bengal with the *Corypha* palms, from which it may be distinguished not only by its entirely different flowers and fruit, but also by its leaf-stalks, which are shorter than the leaves and contrast with the comparatively much larger leaf-stalks of the *Corypha* palms; moreover the leaf itself of the *Borassus* is of a much more moderate size than the enormous leaves of the genus *Corypha.*

The palmyra is one of the most striking objects of the Indian countryside and, as well as being a handsome ornament to the landscape, is with the exception of its relative the coconut palm perhaps the most important tree in the country. The uses to which it is put are too numerous to mention, as may be realised when it is related that a famous Tamil poem known as "Tala Vilasam" describes 801 different ways in which the tree is employed by men; and even that poem does not exhaust the list because various portions of the tree are now used for purposes not mentioned in the poem. Every part is turned to account in some way or other, and some parts have a multitude of uses.

Male palms are frequently tapped for their juice, or sap, which is procured by pruning off most of the lower leaves when the tree is about to come into flower, and then drawing the juice from the young flowering stalks, which are first beaten and crushed to induce a rapid flow of sap. One tree will give as much as 3 or 4 quarts of juice per day for about 5 months. The juice is a pleasant and beneficial drink when fresh, and quickly ferments to form an intoxicating beverage. It is often distilled to make "palm wine" or "arrack", which can be a very potent drink. In Bengal the trees have to be licensed, before they are tapped, and their license plates may be seen nailed to their trunks; but it seems that the so-called "toddy palm" is not the most important source of toddy in the province, since a larger quantity comes from the wild date palm, *Phoenix sylvestris*. The fresh juice is usually drunk before sunrise.



*BORASSUS FLABELLIFER*

In some parts of India large quantities of sugar known as "jaggery" are made by boiling the fresh juice or toddy. Vinegar is also made in large quantities from the juice, and is much used for making pickles.

The jelly-like contents of the young fruit is pleasant and refreshing and the ripe fruit is eaten raw, or more often roasted. A kind of cake is also made out of the pulp of the fruit, which is thus preserved for long periods. When about the size of a hen's egg, the young fruit is used for pickling, and the undeveloped kernels of the seeds are a cool and refreshing food in the hot weather. The first shoots of the young seedlings are eaten as a vegetable.

A great variety of articles are made from the leaves of this palm, including carpets, fans, mats, and umbrellas. At Diamond Harbour hats have been made of this material for many years, and are often sold to visitors. The leaves are also extensively used for thatching. At least five different fibres are obtained from the tree, including one from the leaf-stalk, which is exported in considerable quantities from Tuticorin for the manufacture of brushes, under the name of "tal-coir" or "palm fibre". The leaves are also widely used as writing material, a metal stylus being employed to make the impression on the specially prepared leaves, which are known as "olas". It is generally believed that the palm-leaf was the earliest writing material used by man, and it is still extensively employed.

The medicinal uses of the tree are very numerous, every part of the plant being credited with healing properties. The fruit is much used as an aperient and to improve the digestion. The juice is a stimulant and an aperient, and is mixed with flour to make a poultice for ulcers and wounds. The ash of the burned inflorescence is prescribed for biliousness, and as a blistering agent.

As an example of the many curious purposes to which the tree is put, it may be mentioned that the leaflets, carefully rolled up, are inserted in the holes made in men's ears to hold jewellery. The tendency of the leaflet to expand gradually widens the hole till it reaches the desired size.

The heart of the trunk is soft but the outer wood is hard, heavy, and durable, weighing about 65 lb. to the cubic foot. The timber from young trees is softer but that from very old trees is of excellent quality, especially if the tree has reached an age of about 100 years. The wood of the female tree is much superior to that of the male, and the male trees are scarcely used for timber unless they are very old. Pillars and posts for houses and verandahs are often made from female trees, and the trunks, split into halves with the heart scooped out, make excellent spouts and water-courses. The dark outside wood of very old trees is used in Europe for making rulers, fancy boxes, umbrella handles and such like purposes. The trunks of young trees are sometimes cut into pieces, and used to attract wild hogs, hares, and other game, which are very fond of the soft, white, spongy heart-wood.

Both Hindus and Buddhists regard the palmyra with veneration, probably because the sacred scriptures were in ancient times written on its leaves. Even now when a Hindu child is put to school, the letters of his first alphabet are inscribed on palm leaves in the traditional way. The leaves are also used for other ceremonial purposes, and the fruits are hung at doorways and at the corners of marriage shamianas as emblems of happiness and prosperity. The linga, or emblem of Shiva, at Tarakeswar in the Burdwan district, is said to be the stump of a palmyra tree, the water that is by custom poured over the linga being in this case poured over a metal cover placed over the natural wood beneath. The word Tarakeswar is derived from *tar* or *tal*, the common name of the tree.

The tree forms a home for a number of animals and a host-plant for many epiphytic plants, which find support in the axils of the broad leaf-stalks. Rats, squirrels, mongooses, monkeys and toddy-cats are among the creatures that frequent the trees, and vultures seem to regard them as their favourite roosting places. The eastern palm swift (*Cypsiurus parvus infumatus*) builds its little nest on the under-side of the broad drooping leaf, and lives its whole life in the neighbourhood of the home tree, never alighting anywhere except beneath the sheltering leaves.

This palm was once considered to be indigenous only in Africa, but it is now known that the Indian tree is a distinct species. It is very common in all the hot and damp parts of India, including lower Bengal. Owing to its short leaf-stalks, which make its crown of leaves less graceful than that of most other palms, it is not much grown in gardens, but nevertheless it is not uncommon even in the urban parts of Calcutta.

The flowers appear in March and April. The fruit ripens in April and May of the following year, and matures in July and August, or sometimes later.

**ELAEIS.** (From "elaia", the Greek name for the olive tree). A genus of 4 species of palms having trunks clothed with the stumps of old leaves, natives of tropical Africa and South America. The large leaves are divided into 2 rows of narrow leaflets set on either side of a long central midrib, which has a short, thick, spiny stalk. The unisexual flowers are borne in short, dense clusters among the leaf-stalks, the two sexes being in separate clusters. The male flowers have 6 stamens, which are joined into a tube below. The female flowers are much larger than the male. The fruit is spongy and oily, and contains 1 to 3 seeds.

**Elaeis guineensis** Jacq.
(Guineensis means "from the coast of Guinea, West Africa").
English, *African oil palm, true oil palm.*
(Not in F.I., F.B.I., and B.P.).

Stem robust, quite straight, 20 to 50 feet high or more, 8 to 12 inches thick or thicker in young trees, bearing the remains of old leaves; leaves of adult palm 20 to 40, 10 to 17 feet long; leaflets 100 to 160 pairs, linear-lanceolate, up to 4 feet long by 2 inches wide, but much smaller near base of leaf; petiole robust, spinous on the margins; spadices interfoliar, the male preceding the female by weeks or months; male spadix

**forming an ovoid mass about 9 inches long by 6 inches broad by 3 inches thick, flowers densely imbricated ; female spadix about 9 inches long by 5 inches broad, branches very numerous ; female flowers much larger than the male ; fruits sessile, ovoid, variable in size, red or orange, or black and white.**

This is a stately, erect, and handsome palm with a dense crown of dark green, rather stiff, feathery leaves on a stout trunk, which is more or less covered with the stumps of old leaf-stalks. In general appearance the adult tree vaguely resembles an immense specimen of the wild date palm (*Phoenix sylvestris*). The young trees have leaves sometimes even longer than those of the adults, and may be known by the leaflets being largest near the tip of the leaf and decreasing in length towards the base, near which they become spines. The flowers are small and very numerous, and are borne in dense, compact clusters with many branches ; the male and female flowers are borne in separate clusters, but on the same tree, the male flowers appearing long before the female. The flowers are fertilised by the wind which blows the pollen from one tree to another.

*ELAEIS GUINEENSIS*

This palm is of great economic importance owing to the oil yielded by its seeds, and in its native country, West Africa, it is among the most useful of plants. The fruit and the oil obtained from them enter largely into the daily food of the natives. A toddy obtained by cutting off the male flower-spike is fermented to form an intoxicating drink and is also used to make a kind of yeast. The main nerves of the leaves and also the leaf-stalks, are made into baskets and brooms, while the fibre from the base of the leaves is used for stuffing cushions. The soft centre of the upper parts of the stem is eaten as a vegetable. Rings and beads are cut from the hard centre of the seeds. The oil and the seeds are important commercial commodities, known as "palm oil" and "palm kernels" respectively. A great many varieties of the tree are grown which produce oil of different qualities, and the oil also varies according to the method of extraction.

This palm is a native of tropical West Africa. It is occasionally planted in Calcutta. Two mature specimens grow (in 1942) in the Curzon Gardens.

**COCOS.** (From "coco", the Portugese for monkey, alluding to the resemblance of the end of the nut to a monkey's head). A genus of about 30 species of spineless, feather-leaved palms, with narrow, pointed leaflets, all natives of tropical South America and the West Indies, one species of which is found in all maritime tropical countries. The male and female flowers are intermingled in the same clusters, the male flower being unsymmetrical with 6 short stamens, and the females being much larger. The fruits are more or less egg-shaped and one-seeded, with a thick, fibrous, outer layer, and a hard inner layer, which has three pores at the base. The embryo of the seed is opposite one of the pores.

In addition to the coconut palm, several rarer species of this genus are occasionally grown in India, especially in the dryer districts. Of these the most common is *C. plumosa* Hook. f., an erect tree up to 40 feet high, with a straight stem covered at the top by the brownish remnants of the old leaf-stalks. The crown of foliage consists of about a dozen large, drooping leaves, with pendulous leaflets set in groups of two or more. The flowers are yellowish and wax-like, and the fleshy fruit is about 1 inch long. This palm is much grown in some countries as an avenue tree, but it does not thrive well in Bengal. A few specimens grow in Calcutta gardens.

**Cocos nucifera** Linn.
(Nucifera in Latin means "bearing-nuts").

| | |
|---|---|
| Bengali, | *narikel, narakel, nairyal, narkul.* |
| Hindi, | *narel, nariel, narial.* |
| Urdu, | *nariyel.* |
| English, | *coconut palm, coco nut, cocoa nut, cokernut.* |

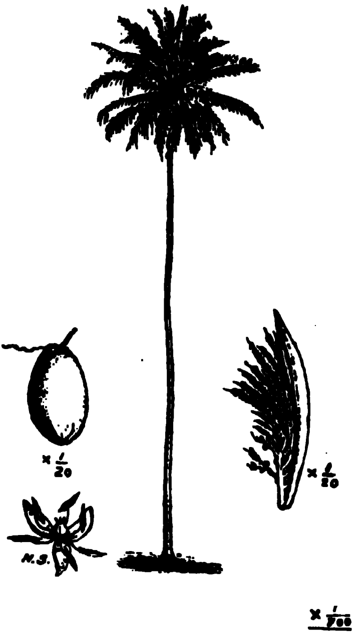
(F.I. p. 664. F.B.I. Vol. VI. p. 482. B.P. Vol. II. p. 1095).

Stem up to 80 feet high (less in Bengal) by about 12 inches thick, from a swollen base, usually flexuous; leaves pinnate, 6 to 13 feet long; leaflets equidistant, 2 to 3 feet long, linear-lanceolate; spadix 4 to 6 feet long, stout, androgynous, divided into numerous drooping spikes, the upper portion densely covered with male flowers, the female (and sometimes a few hermaphrodite) near the base; petals of male flower ½ inch long; female flowers globose, 1 inch long; fruit 8 to 12 inches long, 3-gonously obovoid or subglobose, green or yellowish.

This is a tall and stately palm with a dark, slender, irregularly curved stem, surmounted by a crown of long, arching, bright green, feathery leaves. The small flowers are borne in numerous spikes which are densely clustered in bunches about two feet long. The male and female flowers are found in the same clusters, the female being near the base of the cluster and much larger than the male.

The well-known fruits are green or yellowish when ripe; they are often borne in large numbers, grouped round the top of the trunk near the base of the leaves. The outside of the fruit consists of thick fibrous mass inside which is the hard shell containing, as well as the seed, a layer of white albuminous matter lining the shell, and a watery fluid. At one end of the shell are three pores, beneath one of which is the embryo of the seed.

The outer fibrous layer of the fruit is polished on the surface, and is adapted to allow the nut to float for long periods, and also to be rolled along the ground by the wind, or simply by the momentum of the nut's fall from the tree, so that it may have a good chance of reaching the waters of a river or of the sea itself, and so of being cast up on a distant shore. In this way the coconut has been helped to spread to all the tropical countries of the world that adjoin the sea ; though it appears to have reached the West Indies and parts of Africa only during historical times, possibly by the agency of man.



*COCOS NUCIFERA*

The embryo of the seed germinates inside the nut ; the young plant first absorbs the albuminous material to be found therein and fills the entire shell, the kernel of which becomes soft ; the roots then push forth through the walls of the shell.

This palm is probably the most important of all trees to man, for in addition to yielding food and drink, it provides several commodities of great economic and commercial importance. Moreover, as in the case of the palmyra palm, the various parts of the tree are utilised in almost countless ways by those who live in countries where the tree is plentiful.

The "milk" found in the interior of the young nuts is much used as a cool drink, and the green nuts, or *dab* as they are called in Bengali, are sold in large quantities for this purpose. This seems to be the principal use to which the tree is put in Bengal.

The oil which is extracted from the contents of the shell is an important article of trade, and is exported in large quantities from south India and Ceylon. It is used principally for burning, cooking, and the manufacture of candles and soap, as well as by people all over the world as a hair oil. The dried kernel, before the oil has been extracted, is known as "copra", and is much used in Europe and elsewhere to make soap, margarine, and various other products. Coir, or the fibre of the husk of the nut, is another product of great importance. It is principally used for making yarn, matting and brushes, and is exported in large quantities from south India, mostly in the form of yarn. Ropes made of this yarn are very elastic and resistant to decay.

Toddy is extracted from the flowering branches before the flowers have opened and from this juice a fermented drink, known as "arrack", or alternatively a coarse brown sugar, is made. In countries nearer the equator this toddy is an important product, but in Bengal the tree seems to be seldom used for this purpose, most of the toddy being obtained from the wild date palm (*Phœnix sylvestris* Roxb.). The white contents of the kernel of the ripe nut, known as the "meat", is eaten raw and is used to make a large number of sweetmeats and other dishes. It is also exported in the form of "shredded coconut" for use by confectioners. The terminal bud of the tree, or the "cabbage", is an excellent vegetable, but the removal of the bud kills the tree. The leaves are valued for thatching purposes, and other parts of the tree are used for building ; indeed in some parts of India and Ceylon the huts of the people are almost entirely constructed out of various products of this palm. The timber, in common with that of other palms, is commercially known as "porcupine wood". It is used for building, and also for spear-handles, walking sticks, and fancy work. It makes very pretty and durable furniture.

The medicinal uses of the tree are numerous. The root is used as an astringent gargle in cases of sore throat, and the immature nuts are employed for the same purpose. The oil is used in the preparation of ointments to cure coughs, and as a vermifuge. A fluid extracted from the shell of the nut by heating is considered a cure for ringworm. The milk is regarded as an aperient.

The principal uses of this palm have now been mentioned, but it also serves a multitude of other purposes, so many in fact that it has been said that if man were provided with nothing but plenty of coconut trees, he would have all that he needed to live a comfortable and interesting life. As an instance of the many ways in which the various parts of the tree can be used, it may be mentioned that the small stalks on which the flowers are borne make good toothbrushes.

In some islands where the coconut abounds, there is found a kind of crab, *Birgus latro*, the robber crab, which is kept by the inhabitants, and fattened on coconuts until fit to eat. This very large crab is specially adapted to live on coconuts, which it opens by first tearing off the fibrous outer layer with its claws, and then breaking a small hole in the hard shell by hammering with one claw, which is much larger than the other ; it then turns round, and inserts the smaller claw into the hole, and extracts the white substance from the shell.

The coconut palm is probably a native of America, and is now cosmopolitan in the tropics though seldom found very far from the sea. It flourishes most near the equator and is not seen at its best in Bengal. A large number of varieties are grown which have fruits of different shapes and sizes, and other peculiarities ; there is a dwarf variety which bears fruit when only a few feet high, another with long spindle-shaped fruit, and another with fruit no bigger than a turkey's egg. The ordinary varieties with green fruit about ten inches long are commonly planted round about Calcutta, and a variety with smaller yellowish fruit is also frequently seen.

The flowers appear principally from March to July, and the fruits ripen nearly a year later. The immature fruits are gathered for their "milk" mostly during the cold and hot seasons. Propagation is effected from seed, the nuts being planted in nurseries from January to April and the young plants being transplanted nearly a year later into holes dug about three feet deep and heavily manured. In Bengal these palms grow best on the banks of tanks and ditches, preferably in sandy soil.

**ATTALEA.** (After Attaleia, the name of several Greek towns called after Attalus I, King of Pergamum, 241-179 B.C.). A genus of about 23 species of lofty, spineless palms, natives of South America, with leaves divided into 2 rows of narrow leaflets set on either side of a midrib (pinnatisect.) The leaf-stalks have fibrous margins. The flowers are mostly unisexual, the two sexes being found on the same tree. The male flowers have at least 10 rather short stamens, and somewhat longer, pointed petals. The fruit is large with a dry, fibrous outer covering, and contains from 2 to 6 seeds.

**Attalea speciosa** Mart.

(Speciosa in Latin means "beautiful").

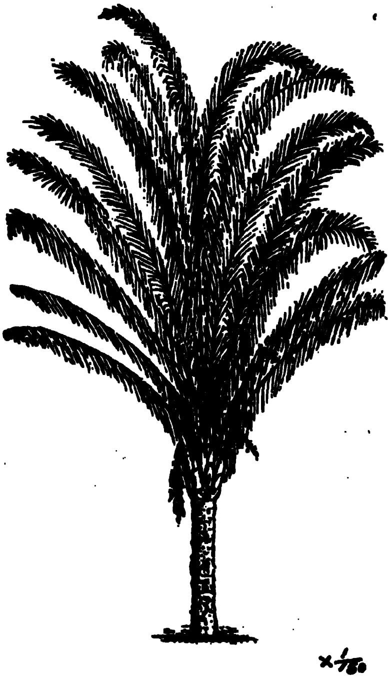
English, *uauassu palm.*

(The word "uauassu" means "large fruit" in a South American vernacular).

(Not in F.I., F.B.I., and B.P.).

Stem 50 to 70 feet high, (but in Calcutta usually not more than 30 feet), straight, cylindrical, clothed with the sheathing petioles for some way below the leaves and in young trees down to the ground; leaves regularly pinnate, 15 to 20, gracefully curved, 15 to 20 feet long or more; segments elongate, closely set together, those near the base longest and pendulous; spadices large, simply branched, enclosed in a woody spathe; flowers monoecious; drupe 3 to 4 inches by 2 inches diam., rusty-tomentose.

This is a handsome palm when seen at its best, with immense dull green, feathery leaves, which spring almost vertically from the stem and curve gracefully to end in more or less drooping tips. The upper leaflets are rather stiff, but those nearest the trunk are longer and their tips hang almost vertically downward. In the case of young trees the trunks are entirely covered with the thick, pale brown bases of the stalks of fallen leaves, which even in old trees always clothe the stem for some distance below the foliage. The flowers are borne in much-branched clusters among the stalks of the lowest leaves. The fruits are large, egg-shaped, and covered with rust-coloured down.



*ATTALEA SPECIOSA*

In this palm's native country the leaves are much used for thatching, the unopened leaves from the centre of the crown being preferred for this purpose.

The tree is a native of Brazil and Guiana. It is occasionally planted in Calcutta gardens, and two specimens may be seen (in 1944) in the south-west corner of Dalhousie Square.

**CARYOTA.** (From the Greek "karuotos", nut-like, on account of the shape of the fruit.) A genus of 12 species of tall palms, natives of Asia, Malaya, and Australia, of which 2 species are found in India. The leaves are very large and broad, and divided into many separate leaflets, which are fan-shaped, or wedge-shaped, with broad, irregularly lobed ends. The flowers are borne, when the tree is fully grown, in large pendulous clusters from above the leaf-stalks in succession beginning at the upper leaves and continuing progressively downwards to the lowest leaf, after which the plant dies. The flowers are unisexual, the two sexes being found on the same tree. The male flowers have many stamens. The fruits are small and globular, usually containing 1 or 2 seeds.

**Caryota urens** Linn.

(Urens in Latin means "burning," or "stinging".)

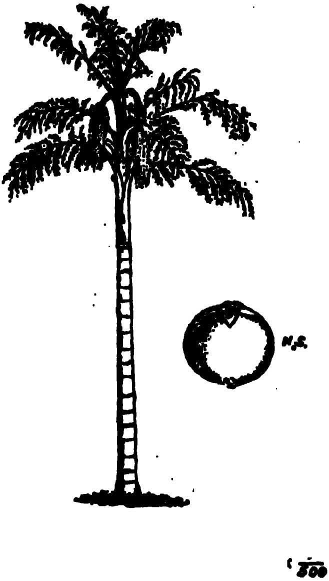
| | |
|---|---|
| Hindi, | *mari, marikajhad.* |
| English, | *Indian sago palm, bastard sago palm, fish-tail palm, hill palm, East Indian wine palm, jaggery palm, kittul tree, toddy palm* (in Ceylon), *wine palm, mhar palm, ghaut palm, elephant's palm.* |

(F.I. p. 668. F.B.I. Vol. VI. p. 422. B.P. Vol. II. p. 1093.)

Trunk annulate, up to 50 feet high by 2 feet thick ; leaves broad, bipinnate, 18 to 20 feet long by 10 to 12 feet wide ; leaflets triangular, 4 to 8 inches long, irregularly lobed or toothed, upper margin of lateral leaflets produced into a tail ; spadix up to 12 feet long ; peduncle stout, curved ; branches simple, very long, pendulous ; flowers monoecious, very numerous, placed in threes, a female between 2 males ; males ½ inch long, stamens about 40 ; fruit 2/3 to ¾ inch diam., reddish when ripe.

This palm is very distinct from all others usually seen in Bengal owing to its huge broad leaves divided into short, triangular, irregularly lobed leaflets, which are set not on the central stalk, or midrib, of the leaf, but on lateral branches of the midrib. The shape of the leaflets has caused this tree to be called the "fish-tail palm".

The leaves are not grouped in a terminal crown as in the case of the great majority of palms, but spring successively from the trunk for a good distance below the summit. They ascend at the base, but are gracefully curved so that the outermost leaflets are pendulous. The unisexual flowers are borne in enormous clusters of hanging spikes reminiscent of docked horse-tails. The flowering begins as soon as the tree is fully mature, when the first cluster of flowers springs from just above the base of the uppermost leaf, and is followed successively downwards by other clusters ; till the final cluster, which sometimes reaches the level of the ground, arrives as the signal that the life of the tree is over. The flowers are followed by masses of small globular, reddish berries hanging in many crowded, pendulous strings.



CARYOTA URENS

This tree is of considerable economic importance, chiefly owing to the very useful "kittul" fibre, which is found naked at the base of the leaf and within the stalks of the leaves and flowering clusters. This fibre is very strong and is made into ropes, brushes, and baskets, and is used for a number of other purposes. Considerable quantities are exported to Europe from India and Ceylon for making brooms, either alone or mixed with bristles.

The pith of the trunk of old trees is considered to be almost equal to the best sago, and in some places is an important article in the diet of the local people, who bake it into a bread, and boil it into a thick gruel. Toddy is also obtained from these palms by means of tapping the spadix, or flowering branch, as much as 20 quarts a day being obtained from a single tree. The toddy is either fermented to make an alcoholic liquor, or boiled down into a dark syrup, which solidifies into palm-sugar, or "jaggery".

The "cabbage," or terminal bud, is edible, like that of most palms. A woolly substance obtained from the surface of the leaf-stalks is used for caulking boats. The seeds are used by Mohammedans as beads. In Orissa the leaves form the chief fodder of elephants.

The nuts are used medicinally to allay thirst and fatigue, and as an application in cases of hemicrania. A glacs of the freshly drawn toddy is often drunk in the mornings as a laxative.

The fruit, bark, and various other parts of the tree in certain circumstances are capable of irritating the skin and causing a tingling or burning sensation. This is said to be the reason for the specific name "urens" (burning). The pulp of the fruit is specially potent in this respect.

The tree is a native of most of the hot and damp parts of India, but thrives best at moderate elevations in the hills, where it is often a very handsome tree attaining as much as 60 feet in height. In Calcutta, however, it is usually a disappointing object as a garden tree, owing to a rather untidy and unkempt appearance that it soon acquires in the climate of lower Bengal. The sago is much eaten by the Lepchas of Sikkim, but the tree seems to be put to little or no economic use in the Bengal plains.

The flowers appear throughout the hot and rainy seasons.

**ARENGA.** (From the vernacular name in the Moluccas). A genus of tall, stout palms comprising 10 species, natives of tropical Asia and Australia. The upper part of the trunk is covered with the black, fibrous remains of the leaf-stalks. The leaves are divided into numerous long, narrow leaflets, with ragged or irregularly shaped ends, set in 2 rows on either side of a central midrib (pinnatisect). The unisexual flowers are borne in large, much branched clusters among the leaves. The male and female flowers are usually found in separate clusters, but occasionally they are intermingled, one female between two males. The males have many stamens and 3 sepals.

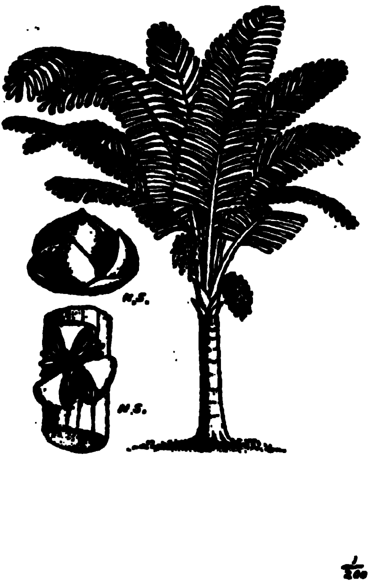
**Arenga pinnata** (Wurmb). Merr. *Syn.* A. saccharifera *Labill.*
(Pinnata is Latin meaning "feathered." Saccharifera means "sugar bearing").

English, *Malay sago palm, gomuti palm, sugar palm, areng palm, sago palm.*

(F.B.I. Vol. VI. p. 421. Not in F.I. and B.P.).

Trunk 20 to 40 feet high, very stout; leaves usually 20 or more, up to 28 feet long and 10 feet broad; leaflets up to 115 on each side, 3 to 5 feet long, subsessile, linear, 4-5-fariously fascicled, toothed or lobed at apex, dark green above, whitish beneath; spadices 6 to 10 feet long, with slender, pendulous branches; male and female flowers usually intermingled; male flowers up to 1 inch long, purplish-black, stamens numerous; female flowers 1 inch diam.; fruit oblong-turbinate, 2 to 2½ inches long.

This is a magnificent palm with an imposing and sombre aspect. Its trunk is short and stout, in Bengal often not more than a few feet high, the immense, narrow leaves springing from a point not far above ground level. The leaves are set with two rows of narrow leaflets, which are dark green above and whitish-grey beneath, and are arranged from the end of the leaf nearly to its base. The leaf-stalks rise almost vertically from the top of the stem, but finally droop downwards in a graceful curve. Many unisexual flowers are borne in large pendulous clusters, the two sexes usually being mixed in the same cluster. The male flower has a disagreeable smell, and is purplish black in colour, and the female flower is unusually large for the flower of a palm. The fruits have a thick leathery skin and 2 or 3 seeds embedded in a jelly-like substance.



*ARENGA PINNATA*

This palm almost rivals in economic importance the coconut and the palmyra, for it produces a great variety of useful products and is widely cultivated in some countries, especially in Malaya. Large quantities of toddy are obtained by beating the spadix, or flowering branch, with a stick and then tapping it near its base, the liquor which pours out being caught in a pot hung from the leaves. This toddy, as in the case of other palms, is either fermented to make an intoxicating liquor or boiled down into a syrup, which on cooling solidifies into a kind of sugar, or "jaggery". The sugar from this palm is of a dark colour and a greasy consistency with a peculiar flavour. In Java the pith, or sago, is much eaten by the poorer people but the sago is inferior to that of the true sago palm (*Metroxylon Sagu* Rottb.) though as much as 200 lb. of it may be obtained from one tree, and much of the sago of commerce is probably obtained from this species. The horse-hair like fibre known as gomuta fibre, which covers the base of the leaf-stalks is considered to be superior to coir for most purposes, and is extraordinarily resistant to wet and decay. It is much used in Malaya for making ropes and cordage, and elsewhere for special purposes such as the covering of submarine telegraph cables. It is also used for thatching roofs, in which case the thatch is said never to need renewal. The natives of Borneo use the fibre for making ornaments for their arms, necks, and legs, which are said to be very pleasing owing to their deep, blue-black colour and neat appearance.

The juice of the fruit is highly stimulating and corrosive, and if applied to the skin causes great pain and inflammation. It is used by the Malays to poison their enemies. The root is considered a useful cure for bronchitis. The young leaves are sometimes eaten as a vegetable, and from the leaf-sheaths sandals are made. The trunks of old trees that have died after ripening their fruit are almost hollow, and are well adapted for use as water pipes, especially as they last a long time underground.

In Sumatra the tree is much reverenced, and the leaves are used in religious rites.

This palm is a native of Assam, Burma, and Malaya, and is cultivated in various parts of India. It is occasionally planted in Calcutta gardens, but is not common. Several specimens may be seen (in 1944) in the shrubbery on the east boundary of the Calcutta Zoological Gardens.

The tree flowers during the rains after about the ninth year of its life. The flowers appear in the axils of the upper leaves and progress downwards ; the tree dies when the fruit of the last and lowest cluster has matured.

**ARECA.** (A variant of a Tamil word meaning a cluster of nuts.) A genus of about 40 species of feather-leaved palms with erect smooth stems, natives of tropical Asia and Australia. The bases of the leaf-stalks expand into smooth, green sheaths. The leaflets are thin, and are attached to the midrib of the leaf in two opposite rows (pinnatisect). The male flowers are numerous and minute, occupying the upper parts of the spike, while the females are few, much larger than the males, and situated at the base of the spike. The male flowers have 3 or 6 stamens. The fruits are more or less elongated, and contain one seed.

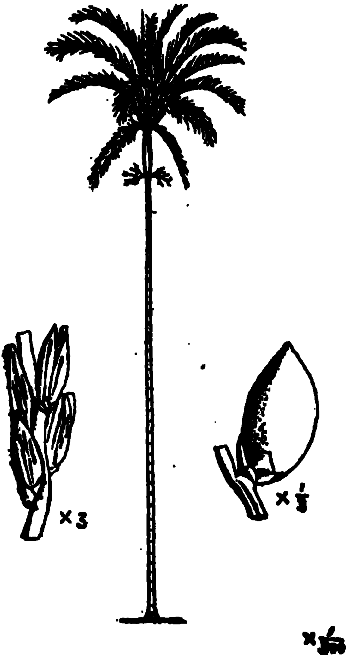
**Areca Catechu** Linn.
(Catechu is a Malayan name).

| | |
|---|---|
| Bengali, | *gua, supari.* |
| Hindi, | *supari, supyari.* |
| Urdu, | *supari.* |
| English, | *areca nut palm, betel nut palm, betel palm, cashoo nut tree, catechu palm, drunken date tree, fasel nut, medicinal cabbage tree, Indian nut tree, Pinang palm, supari palm.* |

(F.I. p. 665. F.B.I. Vol. VI. p. 405. B.P. Vol. II. p. 1097.)

Trunk quite straight, up to 100 feet high (in Bengal probably not more than 80 feet), and about 6 inches thick ; leaves pinnate, 4 to 6 feet long ; leaflets numerous, 1 to 2 feet long, the upper confluent ; spathe double, compressed ; spadix much branched ; male flowers very numerous, sessile ; stamens 6, sagittate ; female flowers solitary, or 2 or 3 together, at or near the base of each branch of the spadix ; sepals 3 ; petals 3 ; staminodes 6, connate ; stigmas 3, short, triangular ; fruit ovoid, 1½ to 2 inches long, smooth, orange or scarlet.

Sir J. D. Hooker, the great botanist, likened this palm to "an arrow shot from heaven, raising its graceful head and feathery crown in luxuriance and beauty above the verdant slopes". Certainly with its straight and slender trunk, topped with a cluster of gracefully curved, dark green leaves, which generally spread far above the surrounding trees, it is one of the most elegant and beautiful of palms. The leaves are divided into numerous narrow, pointed leaflets, closely set in two straight rows on opposite sides of the midrib, the outermost leaflets being more or less joined to form a single large terminal leaflet. The small flowers are borne in several branched clusters below the leaves, the male flowers being much smaller and much more numerous than the female. The fruit is a rather large, smooth, egg-shaped berry, orange or scarlet when ripe, and containing a single seed.



*ARECA CATECHU*

The tree is cultivated chiefly for its "nuts" or seeds, which are about as big as a small hen's egg, and are used throughout the East as a masticatory. The seeds are cut into slices, which are placed with a little lime-paste, and sometimes with a small portion of tobacco or other flavouring matter, in a leaf of the betel vine (*Piper Betle* Linn.), generally known in India as *pan* leaf. The chewing of betel nut has become such a universal habit in India that it is now largely interwoven with the customs and etiquette of the country.

The nut is considered to have valuable medicinal properties as a digestive, as an astringent, and as a vermifuge for both men and animals. It is also believed to have tonic properties, and is used as a dressing for ulcers. The young leaves are employed to cure lumbago, and the root to heal sore lips. The unripe fruit is poisonous and harmful to the eyesight.

The wood is made into furniture, pins, bows, spear-handles, and scaffolding-poles ; it is said to weigh about 57 lb. to the cubic foot. The sheaths of the leaves are used to wrap up articles and as paper to write upon. The seeds have a reticulated appearance when cut and polished, and are turned into beads for necklaces and other small ornamental articles. In Malabar the leaf-sheaths are made into hats.

The native country of this palm is unknown, but it is cultivated throughout the moist tropical belt that fringes the coasts of India, seldom extending more than 200 miles from the sea. It is rare in the urban districts of Calcutta, but is much cultivated in neighbouring villages, especially to the south of the city. The flowers appear for the most part in the early hot weather, but also at other times ; the fruits ripen about nine months after the flowers and are mostly harvested from October to January. The young trees are often protected by plantations of *Erythrina indica* Lam. (Bengali, *palitā mandar*), and are usually spaced at intervals of about 6 or 7 feet, which allow the trees to develop healthily and also permit gatherers of the fruits who have climbed to the summit of one tree, to cross to the next tree, without descending to the ground, by simply causing the tree on which he is clinging to sway till he can pass to the next. Young trees planted in the open may bear fruits after 7 years, but those in plantations take 30 years to come into bearing ; the total life of a tree is said to be from 60 to 100 years.

**CHRYSALIDOCARPUS.** (From the resemblance of the fruit deprived of its outer skin to a chrysalis). A genus of about 7 species of small palms with leaves divided into numerous segments which are forked at the apex, and set in 2 rows on either side of a central midrib (pinnate). The male and female flowers are found on separate plants, the male flowers having 6 stamens, and the female flowers stout triangular stigmas. The fruits are small and fleshy.

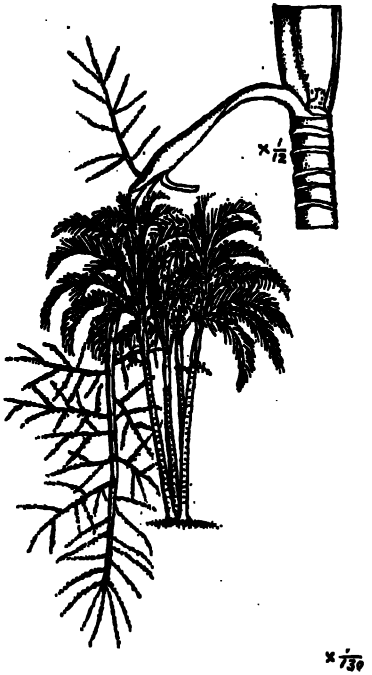
**Chrysalidocarpus lutescens** H. Wendl. *Syn.* Areca lutescens *Bory.*
Hyophorbe indica *Gaertn.*
(Lutescens in Latin means "becoming yellow").

English, *yellow areca palm, areca palm.*

(Not in F.I., F.B.I., and B.P.).

Stems several, about 3 inches in diameter, up to 25 feet high, annulate, rings about 4 inches apart ; leaves 6 to 8, terminal, spreading, pinnatisect, up to 5 feet long ; segments 40 to 50 pairs, narrowly lanceolate, long-acuminate, unequally bifid, about 1 inch wide ; petiole about 2 feet ; spadix shortly triangular, about 1 foot long ; flowers dioecious, white ; fruit baccate, ellipsoid-turbinate, resupinate, black-violaceous when ripe.

This is one of the most common palms in Calcutta gardens, for it is easily propagated and when young forms small clumps which are neat and very ornamental. It may be known by its thin stems, seldom more than 3 inches thick, and by its bright green, pointed leaflets closely set in two rows on the central stalks of the graceful leaf. It is usually grown as a low shrub, when it does not flower, but if allowed to mature reaches a height of 15 feet or more, and produces rather large, open clusters of flowers which droop below the leaves. The male and female flowers are borne on separate plants. The fruit is a small berry, which turns orange and then blackish when ripe.



*CHRYSALIDOCARPUS LUTESCENS*

This palm is a native of Madagascar and is now much cultivated in hot countries. It is often grown as a pot plant.

**Chrysalidocarpus madagascariensis** Becc. *Syn.* Dypsis madagascariensis *Nichols.* Areca madagascariensis *Mart.*

(Madagascariensis means "of Madagascar").

(Not in F.I., F.B.I., and B.P.)

Stems up to 30 feet high and 3 to 6 inches in diameter, rings not conspicuous; leaves interruptedly pinnate, rachis up to 9 feet long; petiole about 14 inches long; leaflets numerous, about 90 pairs, linear, about 15 inches long by ¾ inch broad, long acuminate, slightly bifid, not crowded; spadix ample, drooping, about 2 feet long; flowers dioecious; sepals orbicular; petals twice as long as sepals; male flowers globose, 1/12 inch diam.; female flowers ovate; staminodes 6; fruit ovoid-elliptic, about ½ inch long.

This is a small palm with slender stems usually in clumps of three or more, and rather short but graceful leaves, which are few in number and divided into two rows of narrow pointed leaflets scattered along the midrib at a considerable distance from one another, so that the leaves have a lighter and more open look than those of other palms. The stems are fairly smooth, and only indistinctly marked with rings, which are about one inch apart. The male and female flowers are borne on separate plants in much-branched, open, drooping clusters.

*CHRYSALIDOCARPUS MADAGASCARIENSIS*

This graceful little palm is a native of Madagascar. It is not uncommon in Calcutta gardens.

The flowers appear during the latter part of the hot weather and the fruits ripen during the rains.

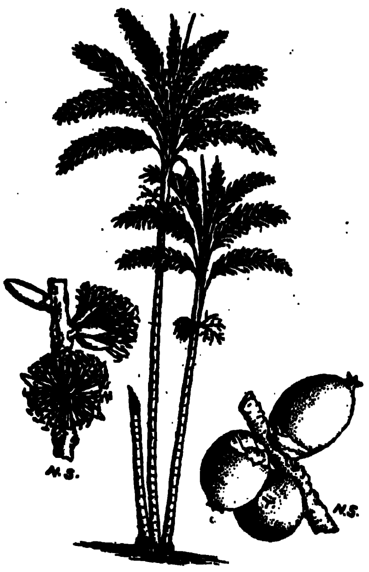
**PTYCHOSPERMA.** (From the Greek "ptyche", a fold, and "sperma", seed, alluding to the internal structure of the seed).

A genus of about 17 species of slender palms, natives of Malaya, Australia, and the Pacific Islands. The leaves are pinnately divided into segments which have broad, ragged ends. The male and female flowers are borne on the same tree in much-branched clusters. The male flowers are symmetrical, and have 20 to 30 stamens. The small fruit is slightly elongated, and contains one seed.

**Ptychosperma Macarthuri** H. Wendl. *Syn.* Kentia Macarthuri *Hort.* (Not in F.I., F.B.I., and B.P.).

Stems several, up to 20 feet high by about 2 inches thick, annulate; leaves pinnatisect, up to 3 feet long; leaflets arching, up to 9 inches long, and up to 3 inches wide, their ends broad, dentate or praemorse; spadix simply branched, up to 15 inches long; flowers monoecious, scattered on the branches of the spadix, the females solitary between 2 males; male sepals small, rounded; petals oblong, ¼ inch long, whitish, rigid; stamens many, anthers white, protruding; pistillode longer than the stamens; female flowers subglobose, greenish, about 1/10 inch long; drupe ovoid, orange when ripe, one-seeded.

This slender and graceful little palm is very common in Calcutta gardens, where it is used to form hedges and small ornamental clumps. It is often planted on the boundaries of gardens, when it is allowed to grow to its full height in order to make a lofty screen. Its stem is more slender than any other erect palm grown in Bengal, and its rather broad, dark green leaflets, with blunt and ragged ends, are quite distinctive. The leaves are not numerous but form a dense crown on the top of the slender trunk. The small whitish flowers appear at all seasons but mostly in February and March, the male and female flowers being intermingled in long spikes which are clustered at the base of the leaves. The male flowers have numerous prominent stamens. The small, orange, egg-shaped berries are very conspicuous when ripe, and may often be seen at the same time as the flowers, for there are usually several clusters of flowers and berries, in different stages of development, on the same plant.



×1/60

*PTYCHOSPERMA MACARTHURI*

Australia is the habitat of this plant, but is now widely grown in tropical countries.

**ROYSTONEA.** (A commemorative name). A genus of 4 species of lofty palms with stout column-like trunks, natives of tropical America. The leaves are divided into numerous narrow leaflets, each split into two pointed segments at the apex, and arranged in two rows on either side of a midrib (pinnatisect). The small whitish flowers are unisexual, the two sexes being borne on the same tree (monoecious). The flowers are not symmetrical. The male flower has 6 to 12 stamens which are exserted far beyond the petals, and the calyx segments are united at the base. The fruit is a small drupe containing a single seed.

Two species are grown in Indian gardens, and may be identified as follows when mature, though they are very difficult to distinguish when young:—

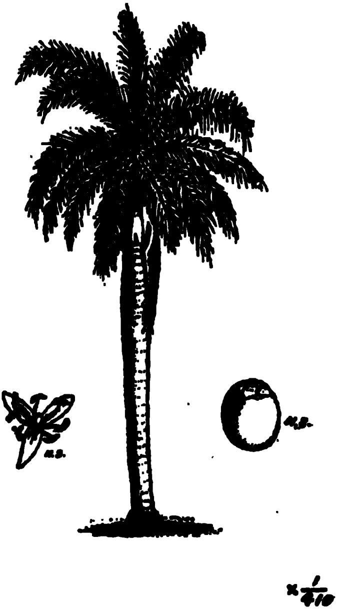
| | |
|---|---|
| Trunk usually swollen above the base; stamens entirely enclosed in the buds; fruit not more than ½ longer than broad. | *R. regia.* |

Trunk swollen at the base and usually tapering gradually upwards; stamens projecting from the buds before they open; fruit nearly twice as long as wide. } *R. oleracea.*

*R. regia* is much the commoner of the two species in India.

**Roystonea regia** O. F. Cook. *Syn.* Oreodoxa regia *Kunth.*
(Regia is Latin meaning "royal").
English, *bottle palm, royal palm, mountain glory. palmiste.*
(Not in F.I., F.B.I., and B.P.).

Stem 40 to 60 feet high by about 2 feet diam. near the base, usually more or less thickened in the middle; leaves pinnatisect, 8 to 10 feet long; leaflets alternately inserted in contrary ways along the rachis, standing in 4 different planes (at least in the lower part of the leaf), ensiform, more or less bifid, up to 3 feet long; spathes 2; spadices 3 to 4; flowers whitish, ternate almost to the ends of the branchlets; male flowers larger than the female; stamens usually 6 or 7; female flowers 1/6 inch long; stigmas triangular, subulate, fleshy; fruit globose-ovoid, less than ½ inch long.



*ROYSTONEA REGIA*

The royal palm is perhaps the most stately of all palms, and is certainly one of the most popular in the parks and large gardens of hot countries. The trunk of the young tree is wide at the base, narrow above, and curiously swollen in the middle, but mature trees have stout, erect, column-like trunks often more or less regular in thickness, though usually showing some trace of the swelling which has caused the tree to be known as the "bottle palm". The trunk is fairly smooth, light greyish in colour, and very slightly marked with horizontal rings. At the top of the grey trunk is a narrower green part of the stem, which consists of a cylinder formed by the leaf-sheaths. The large, gracefully curved leaves are divided featherwise into numerous slender leaflets, which are scattered closely along both sides of the midrib. The small, straw-coloured flowers appear in drooping clusters which emerge at the top of the grey stem below the green leaf-sheaths, and the fruit is a slightly elongated berry, violet when ripe.

This palm is a native of the West Indies, and is now commonly planted in India. A large number may be seen in Calcutta squares, where they are often planted in impressive rows.

The flowers are borne in the hot weather and the rains.

The young leaves are edible and in the tree's native countries are used as a vegetable.

**Roystonea oleracea** O. F. Cook. *Syn.* Oreodoxa oleracea *Mart.*
(Oleracea is Latin meaning "eatable as a vegetable").
English, *cabbage palm, cabbage tree, Barbados cabbage-tree, American cabbage-palm.*
(Not in F.I., F.B.I., and B.P.).

Stem thickened at the base, more or less uniformly tapering upwards, annulate, up to 130 feet high (in Bengal probably not more than 80 feet); leaves pinnatisect, up to 20 feet long (less in Bengal); segments about 200 on each side, up to 3 feet long, lanceolate-linear, acuminate; spadix decompound, at base of green cylinder formed by leaf-sheathes; flowers yellowish, crowded, ternate, the middle one female; stamens 6; female flowers half the size of the male; stigmas 3, sessile; staminodes forming a 6-dentate cupule; fruit a drupe, obovoid-oblong, about ¾ inch long, violet when ripe.

This tall and handsome palm is very like the royal palm, *R. regia* (see above) but, except when young, it may usually be distinguished by its trunk, which is more slender, and more brownish in colour, is marked with more prominent rings, and is seldom swollen except at the bottom. Above its broad base the trunk is usually straight and regular with a tendency to taper gradually until it suddenly narrows where it joins the green cylinder formed by the leaf-sheaths. But the characteristics of its trunk are not constant, and for a certain identification a reference to minute characters is necessary, (for which see the key given above under the description of the genus). In its native haunts this species is said to attain much greater proportions than *R. regia,* but in

× 1/400

*ROYSTONEA OLERACEA*

Bengal the two species seem to be much the same in size and general appearance, apart from their rather different trunks.

The young shoots of this tree are eaten as a vegetable in countries where they are abundant, and are made into pickles. A kind of sago is obtained from the pith, and the inside skin of the leaf-sheaths is used like vellum as a writing material. The wood is very hard, but so thin that it can only be used for such things as walking-sticks and ramrods. The broad part of the foot of the trunk is made into cradles for children.

The West Indies are the native land of this palm. It is much cultivated in tropical countries and occasionally planted in Calcutta gardens. A specimen could be seen (in 1943) on the east of the garden of Government House.

The flowers appear throughout the hot weather and rains.

**EUTERPE.** (The classical name of the Muse of dancing, from a Greek word meaning "charming"). A genus of about 8 species of slender, erect, spineless palms with "feather" leaves and narrow, long-pointed leaflets. The small flowers are borne in branching clusters from below the leaves, the male and female flowers mingled in the same clusters, the males being more numerous and mostly situated at the ends of the numerous spikes, while the more scarce female flowers are near the base of the spike. The male flower has 6 stamens. The fruit is a small fleshy berry containing a single seed. As the fruit develops the stigmas become displaced until they are situated at the side of, or near the base of, the fruit.

These palms are natives of tropical America and the West Indies, where 3 species are commonly cultivated as food producers.

**Euterpe** *species.*

It has not been possible to refer this palm to any species of which a description is available in Calcutta, and enquiries made at Kew and in the U.S.A. have so far proved fruitless also.

(Not in F.I., F.B.I., and B.P.).

Stem up to 60 feet high by 10 inches thick at the base, annulate, smooth; leaves about 12, glabrous, pinnatisect, unarmed, 10 to 12 feet long (including the petiole); rachis and petiole convex below, concave above except near the apex where the rachis has a strong broad keel above; base of rachis, petiole, and sheath white-farinose; leaflets mostly in alternate groups of 2 to 4, linear, acute, up to 30 inches long by 1¼ inches wide, dark green above, pale beneath; spadix infrafoliar, yellowish-green, about 4 feet long, spirally branched; flowers monoecious, in spikes 8 to 12 inches long, protandrous, sessile, crowded, about 1/12 inch diam.; males mostly at the tops of the spikes; sepals 3; petals 3, valvate, rigid, acute; stamens 6, white, anthers versatile, exserted; female flowers few, mostly at the base of the spike, one female usually between two males; staminodes 0; stigmas 3, sessile, in fruit subbasal; drupe oblong, compressed, 1-seeded.

This handsome palm usually grows solitarily, but occasionally a group of stems may be found in a compact cluster as if the plant were gregarious. The stems are quite erect and straight in young plants, but as the palms grow old their trunks become irregularly bent as in the case of the coconut palm (to which this plant bears a superficial resemblance in other respects also). The large feathery leaves are grouped at the top of the stem; each consists of narrow, long-pointed leaflets, dark green above but pale beneath, set in two rows on either side of a gracefully curved midrib. The bases of the leaves broaden out into wide, rounded sheaths, which embrace the top of the stem and are covered with a thin layer of a white floury substance, by which the tree may easily be distinguished from almost all other palms. The small whitish flowers are crowded on narrow spikes, which form the smallest branches of large clusters, several of which spring from the old leaf-sheaths below the leaves. The flowers are of two kinds, male and female, the males being more numerous and situated near the end of the spike while the females are fewer and scattered near the base of the spike. The fruit is a small berry like a pea, purplish when ripe.

*EUTERPE SPEC.*

This palm is becoming quite common in Calcutta gardens and appears to seed itself spontaneously in Bengal. Several old specimens are to be found in the Royal Botanic Garden and in the Royal Agri-Horticultural Garden, but the history of its introduction into Bengal is unknown and at the time of going to press its species has not been ascertained.

The flowers appear in May and June and the fruits ripen towards the end of the rains. The young seedlings are almost indistinguishable from those of *Chrysalidocarpus madagascariensis.*

# GRAMINEAE

This is the great family of grasses, comprising about 450 genera with 4,500 species, mostly creeping herbs (but those of the tribe *Bambuseae* are shrubs or trees). The stems are usually hollow with more or less equidistant joints, or "nodes", which form solid divisions in the tube formed by the stem. The leaves spring from the tops of sheaths that enclose the stem but are split down the side opposite the blade of the leaf. The flowers are usually bisexual; but occasionally unisexual, when the two sexes are often found on the same plant. The flowers are very small, and are combined in "spikelets" containing 1 or more flowers, which are usually numerous and form part of a spike, which in turn often forms part of a large spray of flowers (raceme or panicle). The spikelets are generally enclosed at their base by 2 empty leaves or bracts, known as "glumes", which are succeeded upwards by other glumes, each of which encloses a flower. Each flower commonly has 3 stamens, but in rice and the bamboos the number is usually 6. The ovary contains only one cell, and usually ends in 2 feathery stigmas which often project outside the glumes. The fruit is one-seeded, consisting of a seed contained in a dry covering, and is known as a "caryopsis". Pollination is usually effected by the wind.

This is one of the largest families of plants and, as it includes all those that yield the cereal crops such as rice, wheat, oats, barley, and rye, it is probably the most important family of all. In addition to the principal cereals of the world, the grasses include a host of other plants that are of value to man, as well as providing the principal food of cattle, horses, sheep, and many other animals.

In this book we are concerned only with the sub-division of the family, or tribe, known as the *Bambuseae,* which consists of the shrubby, or tree like, grasses known in English as bamboos. These comprise about 33 genera with 500 species, mainly tropical, but extending up to 12,000 feet in the Himalayas. The stamens usually number 6, and the fruit is generally a small nut. The bamboos as a rule only flower once in the life-time of a plant, after which the plant dies and in nature is replaced by the seedlings produced by its numerous seeds. In the case of some species all the plants in an area flower simultaneously at irregular intervals, in accordance with laws that are not properly understood, and then die together. Other species flower irregularly, at long intervals but not gregariously, and die as soon as they have flowered; while only a few flower nearly every year and do not die after flowering. In cultivation bamboos are usually propagated by offsets or layers.

The young stems of bamboos are partially covered by large sheaths which spring from the nodes. These "culm-sheaths" usually soon fall off as the stems mature, but are often valuable means of identifying the plants.

A large number of species of bamboos are found in the plains of India and Burma, and several exotic species are grown in Indian botanical gardens. Those described below cannot, therefore, be expected to include all the species that are grown near Calcutta, and no doubt others will occasionally be found. Unfortunately, for the reasons explained above, a flowering bamboo is by no means a common sight, and as it is far from easy to identify a bamboo without its flowers, the identification of any unusual bamboo is likely to be a matter of some difficulty.

**BAMBUSA.** (A Malayan vernacular name). A genus of about 50 species, natives of eastern Asia and Australia. The stems are usually tall and erect. The stamens number 6 and are not joined together. The fruit (or caryopsis) is grooved on one side, and has a thin covering, which adheres to the seed.

In addition to the tall bamboos described below, *B. nana* Roxb. (Bengali, *chhota bans*), a dwarf shrubby plant 6 to 10 feet high, is often grown in gardens to form dense ornamental clumps. It is a native of China, and is found in Calcutta, though not commonly.

**Bambusa Tulda** Roxb.

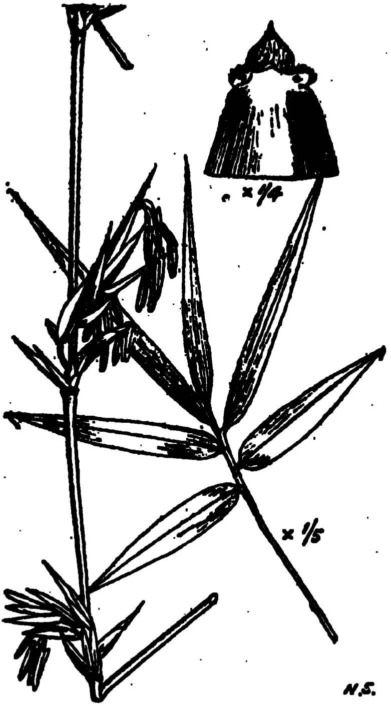
(Tulda is the ordinary Bengali name).

Bengali, *tulda, jowa, mitenga, matela-bans, kiranti.*
Hindi, *peka, chau.*

(F.I. p. 304. F.B.I. Vol. VII. p. 387. B.P. Vol. II. p. 1232).

Gregarious; densely tufted; culms unarmed, 20 to 70 feet high, 2 to 4 inches diam., walls thick; nodes not swollen; lower branches stiff, generally leafy; blade of culm-sheaths triangular or reniform with a cordate base, 6 to 9 inches long, slightly hairy within; leaves usually 6 to 10 inches long by 1 inch wide, nearly glabrous above, puberulous beneath; ligule narrow, inconspicuous; flowering culms leafless; spikes glossy, sessile, 1 to 3 inches long; spikelets many, long, terete; anthers obtuse; caryopsis cylindric, ½ inch long, apex obtuse and hirsute.

This is the commonest bamboo in lower Bengal, often cultivated in clumps near villages. Its stems are tall and slender with thick, dark greyish-green walls, and nodes that are not appreciably swollen. The slender branches that spring from the lower nodes nearly always bear leaves. In June, at about the time of the break of the monsoon, the new shoots appear among the old stems, and in the course of about thirty days grow to their full height before putting out any lateral branches. The leaves are pointed and very narrow, with broad, often rounded bases, and are usually slightly hairy on the lower sides.



*BAMBUSA TULDA*

This bamboo sometimes flowers gregariously, and at other times single clumps will be found in flower, but as a rule the flowering may be considered an uncommon event. When in bloom the plant sheds all its leaves, and the whole stem becomes one vast panicle of innumerable small grass-like flowers. The seeds are flat and exactly resemble the grain of oats. The flowering time is the month of May.

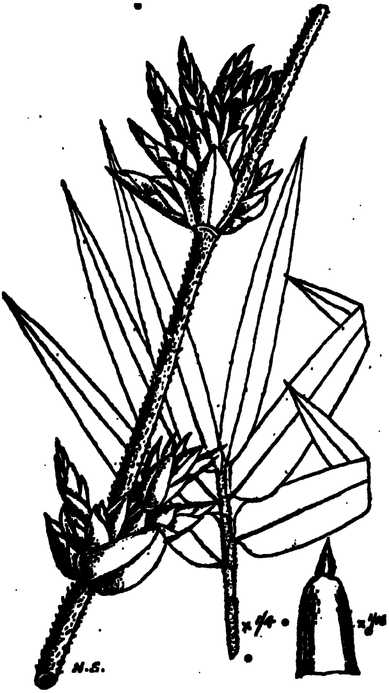
The culms of this bamboo are used for all general purposes in lower Bengal, especially for building and making fences, mats, and baskets. Very large quantities of these stems are also collected for making pulp in the local paper mills. The young culms are sometimes eaten as a vegetable and pickled.

This species is abundant in the plains of north-east India and Burma. It is said not to be indigenous near Calcutta, and although very common everywhere, it is certainly true that, like all other bamboos in lower Bengal, it only survives where it is protected and tended.

**Bambusa Balcooa** Roxb.
(Balcooa is a latinized form of the Bengali name).
Bengali, *bhalkua, balku-bans.*
(F.I. p. 305. F.B.I. Vol. VII. p. 391. B.P. Vol. II. p. 1233).

Densely tufted; culms unarmed, 50 to 80 feet high, 3 to 6 inches diam., walls thick; nodes swollen with a whitish ring above; lower branches stiff, leafless; culm-sheaths ciliate, the upper 6 to 8 inches long, triangular, the lower shorter with a rounded tip; leaves usually 6 to 12 inches long by 1 to 2 inches wide, pale and soft-pubescent beneath; petiole very short; ligule broadly triangular, membranous; spikelets ovate, ⅓ to ½ inch long, in dense heads scattered in large, often leafy panicles; ovary ovoid, narrowed into a hairy style.

After *B. Tulda* this is the most common bamboo in lower Bengal, and is frequently found growing in clumps near villages. Its stems are very tall with dark green, rather thick walls, and distinctly swollen nodes. A number of stiff, leafless branches spring from the lower nodes as if to protect the stem from injury. The leaves are long and pointed, rather wider as a rule than those of *B. Tulda,* and set on very short stalks. The flowers appear at long and irregular intervals; they consists of great numbers of small spikelets, like the flowers of small grasses, set in numerous dense clusters



*BAMBUSA BALCOOA*

in large branching panicles, which sometimes bear leaves as well as flowers. The flowering time is the rainy season.

This is the best species of bamboo in lower Bengal for scaffolding and general building purposes. Sound stems are valuable for this reason and are seldom used in other ways, but inferior culms are employed for fencing, paper-making and many other purposes.

This species is indigenous in the north-east of India, but probably not in the neighbourhood of Calcutta, where it only survives where protected by man.

**Bambusa arundinacea** Willd. *Syn.* B. spinosa *Roxb.*
(Arundinacea means "reed-like").

| | |
|---|---|
| Bengali, | *bans, behar bans, ketua, katausi.* |
| Hindi, | *bans, kattang, magar bans, nal bans, kanta bas.* |
| English, | *thorny bamboo, spiny bamboo.* |

(F.I. p. 303, 305. F.B.I. Vol. VII. p. 395. B.P. Vol. II. p. 1233).

Densely caespitose, gregarious; culms graceful and curving, 80 to 100 feet high, 6 to 7 inches diam., nodes prominent, the lower with long horizontal shoots armed with recurved spines; culm sheaths up to 15 inches long, coriaceous, top rounded, edges plaited; leaves up to 8 inches long by 1 inch wide, with a sharp stiff tip; base rounded, ciliate; ligule short; panicle enormous, often occupying the whole stem; spikelets ½ to 1 inch long, in loose clusters, sessile, lanceolate, acute; caryopsis about ¼ inch long, grooved on one side.

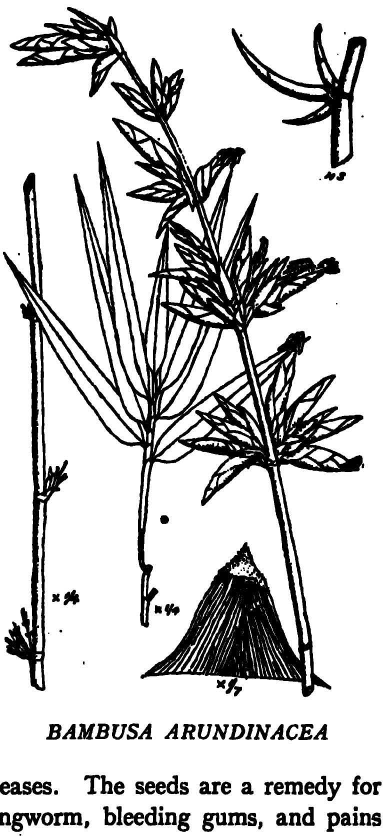
This magnificent species can be easily recognised by its lofty stems with graceful drooping tips, and by the formidable thorns with which the dense clumps of stems are armed round their bases. Its culms are very tall and stout with prominent nodes, but have thinner walls than most other bamboos. The stem-sheaths are remarkable, being thickly clothed with golden hairs when young, and orange-yellow in colour, often striped with green or red. The leaves are slender with a sharp, pointed tip and a rounded base. The innumerable spikelets of flowers grow in loose clusters forming an immense branching panicle, which sometimes embraces the whole plant.

This bamboo is indigenous in most parts of the plains of India, Burma and Ceylon, and is cultivated in the valley of the Ganges. In dry districts it is usually found on the banks of streams and in valleys. It flowers gregariously at intervals of about 30 years, when all the clumps in a district suddenly produce flowers instead of leaves, and having fruited, die. It is occasionally planted in the neighbourhood of Calcutta, but is far from common, and is little known in lower Bengal. The flowers appear about the time of the break of the monsoon, but are very rarely seen near Calcutta.

The culms are much valued as building material, for scaffolding, and for all the other purposes to which bamboos are ordinarily put, including paper-making, for which large quantities of this species are imported into Bengal from Orissa and elsewhere. The forests are difficult to work owing to the dense entanglement of thorny branches which is interlaced with the stems.

The grains make an excellent food, and are eagerly sought after on the rare occasions when this species flowers.

This bamboo has a number of medicinal uses. The stem and leaves are used to cure diseases of the blood, biliousness, leucoderma, inflammations, wounds, bronchitis, and many other diseases. The seeds are a remedy for biliousness, and the root for ringworm, bleeding gums, and pains in the joints. A poultice made from the leaves is a favourite application to ulcers. The young shoots are said to have a lethal action on mosquito larvae.

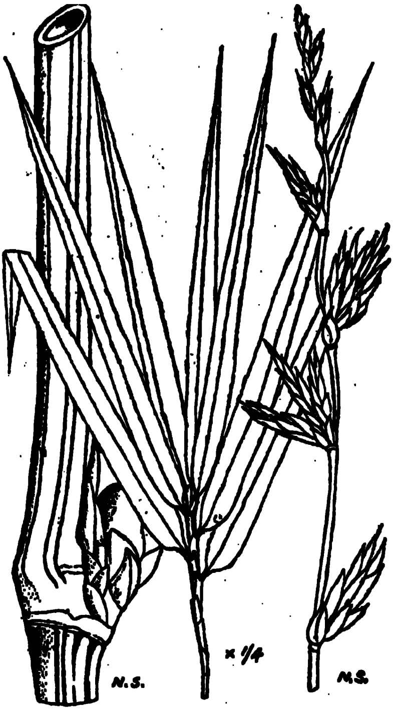


*BAMBUSA ARUNDINACEA*

**Bambusa vulgaris** Schrader.
(Vulgaris is Latin meaning "common").
Bengali, *basini bans, bansini.*
English, *golden bamboo, yellow bamboo.*
(F.B.I. Vol. VII. p. 391. B.P. Vol. II. p. 1233. Not in F.I.)

Caespitose, but clumps not dense; culms polished, often striped green and yellow, unarmed, 30 to 50 feet high, 3 to 5 inches diam., walls thin; nodes scarcely swollen; culm-sheaths clothed outside with brown hairs, triangular with a rounded base, 6 to 10 inches long; leaves 6 to 12 inches long by 1 to 2 inches broad, slightly hairy beneath when young, otherwise glabrous; ligule short, ciliate; spikelets in bracteate clusters, compressed, ½ to 2/3 inch long, 6- to 10-flowered; style long, hairy; stigmas 3, plumose.

This is a handsome bamboo growing in rather open clumps, with slender, polished stems, which are bright green, or yellow, or a mixture of the two colours in stripes. The walls of the stems are very thin, and the nodes are only slightly swollen, but usually have a hard, sharp ridge at the widest part, and are often covered with brown hairs. The very slender, pointed leaves generally have twisted tips, and grow on short stalks. The flowers consist of numerous flattened spikelets in dense clusters forming a large, leafy, branching panicle.



*BAMBUSA VULGARIS*

This bamboo is believed to be a native of Java, but is chiefly known in cultivation, since it is commonly grown in most tropical countries for use and for ornament. It is found throughout India, but only in cultivation, and in lower Bengal it is largely confined to gardens, though it may occasionally be met with near villages among other bamboos. Several varieties are grown, differing chiefly in the colour of their stems, which may be all bright green, all yellowish, or yellow and green in stripes. The best known variety is perhaps one with very handsome, slender, orange stems which is common in Calcutta gardens, and has been named *var. striata*.

The culms are used for building and other purposes, but are much more scarce in Bengal than those of the first two species described above. The split culms are made into mats and baskets.

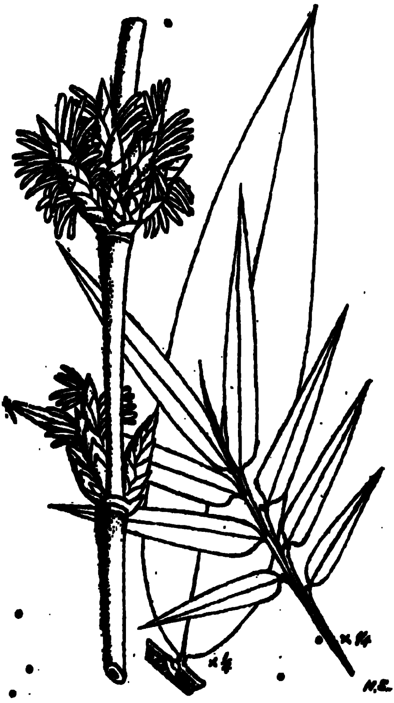
**DENDROCALAMUS.** (From the Greek "dendron" a tree, and "kalamos", a reed). A genus of about 24 species of tall, thornless bamboos growing in dense clumps, all natives of south-eastern Asia, of which about 8 species are found in India. The flowers are contained in egg-shaped spikelets containing several flowers, of which usually only one is fertile. The spikelets are borne in more or less spherical groups forming part of a large branching cluster (panicle). The stamens number 6. The seed is enclosed in a hard shell, but is not attached to it.

This genus includes *D. strictus* Nees. (Bengali, *karail*), the male bamboo, which is very common in almost all the dryer parts of the plains of India. Its stems are almost solid, with very swollen nodes and numerous short stiff branches (one of which at each node is much larger than the others) springing from the lower part of the stem. The leaves are hairy on both sides. This bamboo may occasionally be planted near Calcutta, but does not thrive there because it requires good drainage and a dryer climate. Very large quantities of the stems are imported into Bengal from Orissa and elsewhere, for pulp-making and other purposes.

**Dendrocalamus giganteus** Munro.
(Giganteus is Latin meaning "gigantic").
(F.B.I. Vol. VII. p. 406. Not in F.I., and B.P.).

Evergreen, densely tufted; culms up to 100 feet high and 8 inches diam. (but less in Bengal); erect, usually naked in the lower part, glaucous when young, greyish-green when old; internodes 15 to 20 inches long; walls ½ inch thick; nodes hairy, scarcely swollen; culm sheaths hard, shining within, thinly hairy outside, 15 to 20 inches long; leaves oblong, cuspidately acuminate, tip twisted, up to 20 inches long by 4 inches wide, unequal-sided, rounded at the base; spikelets ovate, ½ inch long, 2 to 5 in a head, on long, often leafy spikes; caryopsis oblong, obtuse, 3/10 inch long.

This magnificent species is the largest bamboo found in India, and with one exception the largest known in the world. Its immense, smooth, greyish green stems in suitable climates form clumps over 100 feet high and 50 feet in diameter, but unfortunately they do not attain nearly this size when grown in Bengal. The stems are bare of leaves and branches near their base, and so their graceful proportions can be clearly seen, and appreciated. Their nodes are placed close together, and are scarcely swollen, the internodes being at first partly covered by hard shining sheaths. The leaves



*DENDROCALAMUS GIGANTEUS*

are much larger than those of any other species usually grown in Bengal, and make this species easy to distinguish. The flowers are enclosed in innumerable small spikelets, which form a series of clusters, or heads, which in turn form the long spikes that make up the huge inflorescence. But the flowers are seldom, if ever, seen in Bengal.

This bamboo is probably indigenous in the hills of Burma, but is now cultivated in most tropical countries, chiefly for ornament in parks and gardens, but in Burma there are large plantations of this species. In Calcutta it is not uncommon in large gardens and clumps may be seen in the grounds of Government House, Belvedere, and the Victoria Memorial ; it may also be found in villages.

The culms make excellent pots for holding water, milk, and other liquids. They are also used for water-pipes, and umbrella stands, and are much valued for building purposes.

## CONIFERAE

A family comprising about 35 genera with 400 species of trees and shrubs, found in all parts of the world. The plants are usually resinous, and the leaves are generally rigid, and needle-like or scale-like, rarely with a broad blade. The flowers are always unisexual and without sepals or petals, the males in catkins and the females usually in cones. The ovules are borne under the overlapping scales of the cones. Pollination is effected by the wind, which blows the copious pollen from the male catkins to the female cones. In the case of most species a long time, sometimes as much as a year, intervenes between the shedding of the pollen and the final fertilisation of the ovule. The seeds are often winged.

The family is only represented by a few plants in the plains of India, but, as it contains the pines, firs, larches, yews, cedars, cypresses, junipers, and many other common trees of temperate countries, it must be reckoned one of the most important families of plants.

In addition to the species described below, a number of others are grown in Indian botanical gardens, and several may occasionally be found planted in the plains of Bengal. In particular more than one species of *Cupressus* (cypress) are grown in the Indian plains, and *Cupressus sempervirens* Linn, the common cypress of the Mediterranean region, is sometimes grown in Bengal as a shrub. Several species of *Juniperus* (juniper) are also grown as shrubs in Bengal gardens.

Modern authorities have divided these plants into several families, which are distinguished chiefly by minute characters in their flowers.

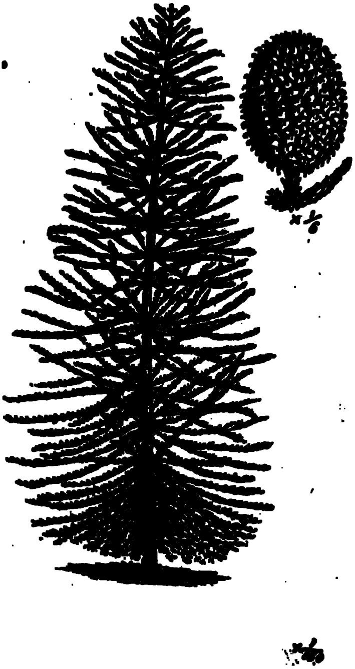
**ARAUCARIA.** (A vernacular name of South Chile). A genus of about 12 species of tall evergreen trees, natives of South America and Australia. The leaves are scale-like and stiff, usually tapering from a broad base, spirally arranged, and regularly overlapping one another. The male and female flowers are generally borne on separate trees (dioecious). The male flowers grow in small catkins, which are arranged in clusters. The female flowers consist of large woody cones, each scale of which conceals a seed.

In addition to the two trees described below, one or two other species are occasionally grown in India. *A. Bidwillii* Hook., the bunya-bunya pine, has spinous leaves about 1/5 inch wide and 1 inch long; a specimen of this tree grows in the Calcutta Zoo. *A. imbricata* Pav. is the monkey-puzzle of English gardens.

**Araucaria Cookii** R. Br. ex D. Don.
(The name Cookii is in memory of the English explorer, Captain Cook, 1728-1779).
English, *New Caledonia pine.*
(Not in F.I., F.B.I., and B.P.).

A slender, columnar, evergreen tree; branches whorled; branchlets pinnately arranged along the branches, crowded, not branching; leaves about ¼ inch long, triangular, mucronate, slightly curved, densely and spirally imbricated; cones 3 to 4 inches diam. and rather longer.

This handsome tree is indigenous in New Caledonia where it reaches a height of 200 feet, and has been likened to "a well-proportioned factory-chimney of great height." In India it does not attain nearly such dimensions, but nevertheless its dark green foliage and short green branches, in regular whorls like a gigantic but slender "Christmas tree", make it a very attractive ornament in any large garden or park.



ARAUCARIA COOKII

The trunk is straight and tapering with rough, dark greyish bark, and the short branches are arranged in rather distant whorls. The numerous green twigs are crowded in two stiff rows on either side of the branch, their tips usually either drooping downwards, or turning gracefully upwards. The twigs are never forked or branched as in the case of *A. Cunninghamii.* Many small, thick, triangular, pointed, thorn-like leaves are densely clustered along the twigs in a spiral manner, the leaf above overlapping the leaf below. The cones are large and broad, but neither male catkins nor female cones are usually seen in Bengal.

In India the trunk sometimes forks near its base, the two halves growing upwards almost vertically and very close together, giving the tree a curious and distinctive appearance. In India also the tree often has a peculiar tendency to lean towards the east.

**Araucaria Cunninghamii** Sweet.
(The name Cunninghamii is in honour of Richard Cunningham, an Australian botanist, 1793-1835).
English, *Moreton Bay pine, hoop pine, colonial pine, coorong.*
(Not in F.I., F.B.I., and B.P.).

A tall evergreen tree ; branches in whorls, the upper usually ascending, the lower horizontal or drooping ; branchlets densely clustered, often branched, pendulous ; leaves on the sterile branches acicular, obscurely quadrangular, rigid, acute, ¼ to ⅓ inch long, crowded ; leaves on the fertile branches shorter, stouter, closely appressed ; male catkins 2 to 3 inches long, about ⅓ inch broad ; female cones 3 inches long by 2 inches broad, the scales broadly cuneate, the apex flattened and bearing a rigid point.

This is a tall, slender tree, said to attain a height of 200 feet in its native home. Its bark is grey and flakes off in small, thin pieces. The branches spring from the tapering trunk in whorls and are densely set with numerous slender, green twigs which are closely clustered along the branches. Each twig is covered with many small thorn-like leaves. The upper branches are usually ascending, but the lower are more or less horizontal or drooping.

This tree may be known from the much more common *A. Cookii* by its densely clustered twigs, which give the tree a softer appearance, not unlike that of a juniper or cypress, in contrast to the rather rigid twigs of its commoner relative. The twigs of *A. Cunninghamii* are often them-

*ARAUCARIA CUNNINGHAMII*

selves branched into several divisions, while those of *A. Cookii* are always undivided.

This tree is a native of Australia. It is not uncommonly cultivated in other countries, but is scarce in Bengal. A specimen grows (in 1942) in the Eden Gardens on the east of the large tank.

Several varieties are found in cultivation including one known as *var. glauca* in which the young trees have beautiful silvery foliage.

**PINUS.** (The ancient Latin name for a fir tree). A genus of about 70 species of evergreen trees with whorled branches and needle-like leaves in clusters of 2, 3, or 5, the base of each cluster being contained in a membranous sheath. The male and female flowers are found on the same tree, the male catkins in crowded whorls at the base of young shoots, the woody female cones usually on separate branches. The seeds are concealed by the spirally arranged scales of the cone, which are more or less thickened at the apex.

The genus includes 4 species indigenous in the hills of India.

**Pinus longifolia** Roxb.
(Longifolia means "with long leaves").

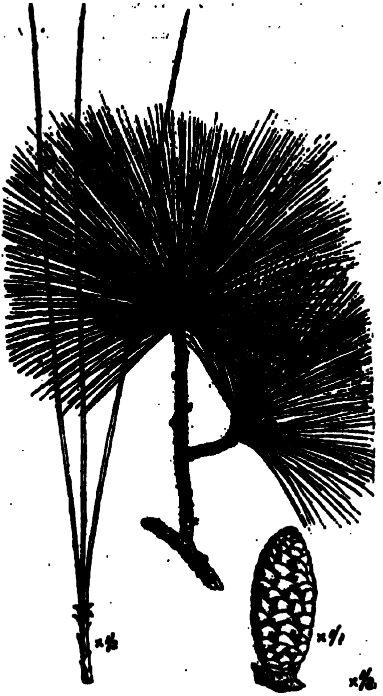
| | |
|---|---|
| Hindi, | *chir, chil.* |
| English, | *long-leaved pine, three-leaved pine, Kumaon pine.* |

(F.I. p. 677. F.B.I. Vol. V. p. 652. Not in B.P.).

A tall, more or less deciduous tree; branches whorled; leaves in bundles of 3, 9 to 15 inches long, very slender, nearly triquetrous, sheath ½ to 1 inch long, persistent; male catkins ½ inch long; cones solitary or in whorls of 2 to 5, 4 to 8 inches long, 3 to 5 inches diam., on short stiff stalks; scales 1 to 2 inches long; seeds ½ inch long, wing membranous.

This is a tall tree with thick, reddish-brown bark cut by deep fissures into large, more or less rounded plates of irregular size. Its branches are symmetrically whorled rather high up the trunk, forming a rounded crown of light foliage. The long, pale green, needle-like leaves hang in clusters of three, the base of each cluster being enclosed in a small greyish-brown sheath. The male flowers consist of little more than innumerable minute stamens collected in small catkins, which are clustered round the base of young shoots, while the female flowers grow on separate branches, and consist of large cones of woody scales, which conceal the winged seeds.

This tree is common in the Himalayas at altitudes of from 1,500 to 6,500 feet. It thrives fairly well in the plains of Northern India, and is occasionally planted in Bengal gardens, but it does not there attain its proper size. A specimen may be seen (in 1942) in the Calcutta Zoo. The flowers appear in the hot season.



*PINUS LONGIFOLIA*

This tree is the principal source in India of resin, the tapping and preparation of which is an industry of considerable importance in some parts of the Himalayas. The timber is moderately hard and of fair quality, weighing about 40 lb. per cubic foot; it is suitable for boat-building, house-building, and for making boxes. The bark is used for tanning, and a kind of ink is prepared by mixing the charcoal made from the leaves with rice-water.

Medicinally this pine has a large number of uses. The gum is given to cure diseases of the head and eye, dyspepsia, ulcers, inflammations, asthma, earache, toothache, lumbago, epilepsy, and various other complaints.

**THUJA.** (An ancient Greek name for a kind of African tree, probably a cedar). A genus of 5 species of resinous trees with short, horizontal much ramified branches, natives of Asia and North America. The small branchlets are flattened, and arranged in a frond-like manner. The leaves are small and scale-like. The male and female flowers grow on the same tree, the male flowers singly at the ends of the branches, and the females in small cones with leathery scales.

**Thuja orientalis** Linn. *Syn.* Biota orientalis *Endl.*
(Orientalis is Latin meaning "eastern").

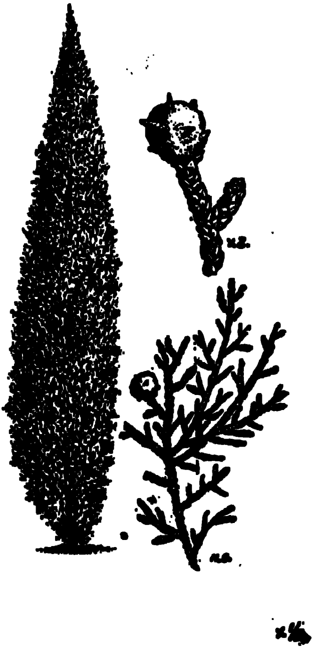
| | |
|---|---|
| Hindi, | *more panki, patajhau.* |
| English, | *Chinese arbor-vitae.* |

(Arbor-vitae is Latin meaning "tree of life").

(F.I. p. 678. F.B.I. Vol. V. p. 644. B.P. Vol. II. p. 992.)

A small, evergreen, monoecious tree or shrub; branchlets green, thin, flattened; leaves opposite, decussate, rhombic-ovate, acute, adpressed, bright green, about ⅛ inch long; cones erect, globose-ovate, ½ to 1 inch long, squarrose, scales with a short horn-like process below the apex; seeds winged.

This is a compact evergreen shrub often conical in shape, with branches reaching to the ground, or a small bushy tree with spreading and ascending branches. The thin brown bark peels off its flakes. The branches are much ramified, and end in very numerous small green branchlets, which are flattened out in one plane so that the branchlets on one twig look collectively like a single divided leaf or frond. The very small, almost minute, leaves are pressed tightly to the little branchlets and arranged in opposite pairs. The male and female flowers grow on the same plant, the males at the ends of the twigs, and the females in small bluish-green, almost spherical cones, each scale of which carries a minute spike on the outer surface.



*THUJA ORIENTALIS*

This tree is indigenous in China and Japan. It is very frequently planted in India for its very attractive, dense foliage and neat, bushy habit of growth, which makes it very suitable for a small garden. There are several cultivated varieties including one named *var. aurea,* which is dwarf in growth and turns golden yellow in colour when it produces its fresh leaves. All varieties grow better in the hills of India than in the plains.

The wood is fairly hard and close-grained, weighing about 33 lb. per cubic foot. It is durable when buried underground, and is suitable for building, and for making barrels and casks.

**PODOCARPUS.** (Greek "pous", a foot, and "karpos", fruit, alluding to the conspicuous fleshy stalks of the seeds of most species). A genus of over 50 species of evergreen trees and shrubs, natives of mountainous parts of the tropics and sub-tropics. The leaves are narrow but flat. The male and female flowers are borne on separate trees or on the same tree. The female flowers consist of scales, each of which encloses an ovule; the scales are not united into cones; as the ovule matures the lower part of the scale thickens and forms a fleshy base for the seed.

3 species are indigenous in hilly parts of India but none of these are found in the plains.

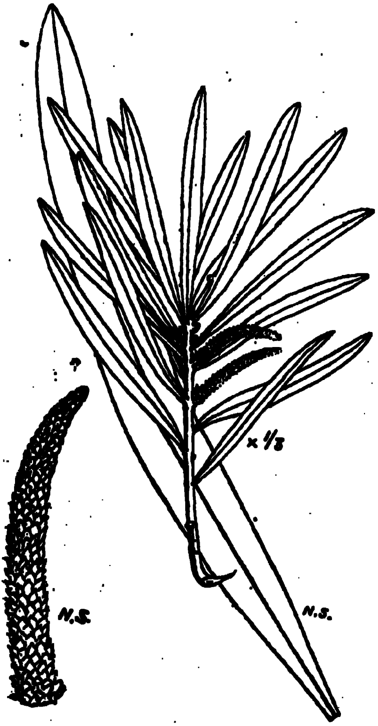
**Podocarpus macrophylla** Don. *var.* Maki *Sieb.* *Syn.* P. chinensis *Wall.*

(Macrophylla is from the Greek, meaning "with large leaves". Chinensis means "Chinese". Maki is presumably a Japanese vernacular name.)

(Not in F.I., F.B.I., and B.P.)

A tree up to 50 feet high, usually dioecious; leaves alternate, spreading, linear-lanceolate, up to 4 inches long, about 3/5 inch wide, coriaceous, dark green above, paler below, midrib conspicuous on both surfaces, narrowed to a very short petiole; male flowers in fascicled spikes about 1⅓ inches by 1/5 inch wide; female flowers axillary, green, ⅓ inch long; seed ovoid, about ⅓ inch long, borne on a fleshy purplish receptacle.

This is an evergreen resinous tree which attains a considerable height under favourable conditions, but in Bengal usually takes a stunted and rather distorted form. Its bark is greyish and fairly smooth, but peals off in small vertical strips to expose a reddish-brown colour beneath. Near the ends of the numerous green twigs the very narrow, leathery-leaves spread in all directions; they are dark green above, but pale beneath, and have a pronounced midrib on both surfaces; their tips are pointed and their bases are narrowed gradually into very short stalks. The male and female flowers are usually, if not always, borne on separate trees. The male flowers are very minute and are clustered in stiff, yellowish-white spikes, which are found in small groups among the leaves. The female flowers are larger, but greenish in colour and very inconspicuous, each consisting of only a few scales, one of which bears a solitary ovule that finally develops into a small egg-shaped seed carried on a fleshy, purplish stalk.



PODOCARPUS MACROPHYLLA

This tree is a native of China and Japan, but is grown in many warm countries for its rather handsome, though sombre, dark green foliage. Several specimens are grown in public gardens in Calcutta.

The flowers appear during the hot weather.

Several variegated forms of this plant are cultivated in the U.S.A.

## CYCADACEAE

A family comprising about 10 genera with nearly 80 species, all natives of the tropics and sub-tropics. The stems are usually thick and unbranched, like the stem of palms, with a closely crowded cluster of leaves at the top. Between the leaves there are bands of small woolly scales. The flowers are unisexual, the male and female flowers being found on separate trees (dioecious). The male flowers consist of erect cones, growing at the top of the stem and formed of numerous thick scales, which bear innumerable anther-cells on the under-surface. The female flowers also form cones of scales crowded round the apex of the stem, the large ovules being borne on the under-surface of the scales. The pollen is carried from the male to the female flowers by the wind, and germinates when it alights on the ovule.

These curious plants are a survival of a group which in past ages made up a large part of the earth's vegetation. Some of them are not unlike tree-ferns in general appearance, and this resemblance extends to microscopic details in connection with the reproductive processes. The cycads are, in fact, a link between the ferns and the conifers.

**CYCAS.** (From an ancient Greek name for a kind of palm). A genus with about 16 species, natives of India, Australia, and Polynesia. The leaves are divided into numerous narrow leaflets set in 2 rows on either side of a central midrib (pinnate). The male flowers are borne in a cone at the top of the stem, and the cone is finally thrust aside by the growth of the stem. The female flowers, or ovule-bearing scales, are at first comprised into a cone, but later spread out as the stem continues to grow through the centre of the cone.

In addition to the species described below, *Cycas revoluta* Thunb. is not uncommon in Indian gardens, though not often seen in Calcutta. This is a small species with a stem less than 6 feet high, and leaves from 2 to 6 feet long. The leaflets are very narrow with rolled-back margins and the midrib of the leaf is square in section. *Cycas circinalis* Linn, a native of tropical Africa, Ceylon, Southern India, and Orissa, may also be found occasionally in Indian gardens; it differs from C. *Rumphii* chiefly in its more numerous and narrower leaflets, which number from 80 to 100 pairs on each leaf and are not more than ½ inch wide, and by the scales of its inflorescence, which are toothed or spinous.

**Cycas Rumphii** Miq.
(Rumphii commemorates G. E. Rumpf, a Dutch botanist of Amboina, 1628-1702).
**English,** . . *Malayan fern palm.*
(F.I. p. 709. F.B.I. Vol. V. p. 657. B.P. Vol. II. p. 993.)

An evergreen, palm-like tree, stem up to 15 feet high in Bengal, (much higher elsewhere); leaves crowded at the top of the stem, pinnate, glabrous, the segments 50 to 60 pairs, elongate-linear, 6 to 10 inches long by ½ to 2/3 inch wide, acuminate, the lower reduced to short, straight spines on the subterete petiole; male cones erect, about 18 inches long,

**the flower scales obovate-cuneate, about 1¼ inches long, acuminate; female carpellary leaves long-petioled, densely tawny-villous, up to 12 inches long or more, entire; seeds glabrous, orange-yellow, 2 to 2½ inches long.**

This is a small palm-like tree with a stout straight trunk, blackish in colour, rough with the scars of fallen leaves, and often studded with small buds, which ultimately fall off and take root in the ground below. Its long slender leaves are crowded at the top of the trunk, and are very numerous, as many as sixty or seventy being the usual complement; they are divided into a great many very narrow, pointed, dark green, smooth and leathery leaflets set in two rows on either side of the midrib, near the base of which the leaflets become small straight spines. Among the leaves at the top of the stem there are many woolly, brownish scales, which surround the bases of the leaves and the flowers. The male and female flowers are borne on separate trees; the males form a compact cone, the scales of which enclose the numerous pollen-cells; the female flowers, or ovule-bearing scales, at first also form a compact cone at the top of the stem, but the stem continues its growth through the centre of the cone, and the scales then spread out, so losing much of their resemblance to a cone. The seeds develop beneath the scales, and become the size of a small hen's egg, yellow in colour when ripe and very strongly scented.

*CYCAS RUMPHII*

This plant may easily be mistaken for a palm, but may be known by its very numerous leaves, which are more crowded than those of any palm found in Bengal, except possible *Phoenix sylvestris*, the wild date palm, (which has a much more slender trunk and greyish-green leaves). The dark green colour and leathery texture of the leaflets of the cycas are distinctive.

The tree is a native of Burma, Malay, the Andamans, and

Australia, where it is said to grow on occasions to a height of 50 feet, though in India it seldom reaches one third of that size. Its crown of dark green leaves is ornamental in a large garden, and it is commonly cultivated in India. Specimens may be seen near the office in the Royal Agri.-Horticultural Garden at Alipore.

The flowers, or cones, appear in the hot season, and the seeds ripen in December or January. In the hot weather the young cones of male plants are bright orange in colour and very ornamental, but their pollen has an unpleasant smell and is apt to cause violent sneezing.

A resin extracted from the stem is used in the treatment of ulcers, and the bulbs are applied to boils, swollen glands, and ulcerated wounds. The seeds are stated by some to be poisonous, but they are also said to be eaten by hill tribes in some parts of India and to be made into flour in Ceylon. The trunk is said to yield a sago, or starch, of good quality.

# LIST OF BOOKS CONSULTED

Bailey, L. H.—The Standard Cyclopedia of Horticulture. (1939).

Bal, S. N.—Catalogue of Food, Spice, and Fodder-Plant Exhibits. (Bot. Sur. Ind. 1939). Useful Plants of Mayurbhanj State in Orissa. (Rec. Bot. Sur. Ind. Vol. VI. No. 10. 1942).

Beddome, R. H.—The Flora Sylvatica of Southern India. (1871).

Birdwood, G.—Catalogue of the Vegetable Products of the Presidency of Bombay. (1865).

Blatter, E.—The Palms of British India and Ceylon. (1926).

Brandis, D.—Forest Flora of North-West and Central India. (1874). Indian Trees. (1911).

Burns, W.—Firminger's Manual of Gardening for India. (1930).

Butterworth, A.—Some Madras Trees. (1911).

Chopra, R. N., Badhwar, R. L., & Goswami, N. C.—Insecticidal and Insect-repellant Plants of India. (150th Anniv. Vol. Roy. Bot. Gar. Cal. 1938.)

Colthurst, I.—Familiar Flowering Trees in India. (1937).

Cooke, T.—Flora of the Presidency of Bombay. (1903).

Corner, E.—Wayside Trees of Malaya. (1940).

Cunningham, D. D.—The Phenomena of Fertilisation of *Ficus Roxburghii*. (Ann. Roy. Bot. Gar. Cal. Vol. I. 1888).

Duthie, J. F.—Flora of the Upper Gangetic Plane. (1903).

Gamble, J. S.—The Bambuseae of British India. (Ann. Roy. Bot. Gar. Cal. Vol. VII. 1896.) A Manual of Indian Timbers. (1902). Flora of the Presidency of Madras. (1915).

Ghosa, J. S.—Sacred Flowers of the Hindus. (Jour. Agri.-Hort. Soc. Vol. VIII. (1895).

Haines, H. H.—Botany of Behar and Orissa. (1925).

Harler, A. W.—The Garden in the Planes. (1943).

Haviland, G. D.—Revision of the Tribe Naucleeae. (Jour. Linn. Soc. Vol. XXIII. 1897).

Hooker, J. D.—The Flora of British India. (1875).

Kanjilal, U. N., Kanjilal, P. C., & Das, A.—Flora of Assam. (1934).

King, G.—The Species of Ficus of the Indo-Malayan and Chinese Countries. (Ann. Roy. Bot. Gar. Cal. Vol. I. 1887).

Kirtikar, K. K. & Basu, B. D.—Indian Medicinal Plants. (1933).

Kumar, L. S. S. & Abraham, A.—The Papaya, its Botany, Culture, and Uses. (Jour. Bom. Nat. His. Soc. Vol. 44. 1943.)

Kurz, S.—Forest Flora of British Burma. (1877).

Lushington, A. W.—The Genus Citrus. (Indian Forester. Vol. XXXVI. 1910.)

Macmillan, H. F.—Tropical Planting and Gardening. (1935).

Nairne, A. K.—The Flowering Plants of Western India. (1894).

Parker, R. N.—Forest Flora of the Punjab. (1918). Forty Trees Common in India. (1940).

Percy-Lancaster, S.—An Amateur in an Indian Garden. (1939).

Popenoe, W.—Manual of Tropical and Subtropical Fruits. (1920).

PRAIN, D.—Bengal Plants. (1903). The Vegetation of the Districts of Hughly, Howrah, and the 24-Pergunnahs. (Rec. Bot. Sur. India. Vol. III. No. 2. 1905).

ROXBURGH, W.—Flora Indica. (1832).

TALBOT, W. A.—Forest Flora of the Bombay Presidency and Sind. (1909).

TANAKA, T.—Further Revision of Rutaceae-Aurantioidiae of India and Ceylon. (Jour. Ind. Bot. Soc. Vol. XVI. 1937). Principal Citrus Fruits of India. (150th Anniv. Vol. Roy. Bot. Gar. Cal. 1938).

TROTTER, H.—Manual of Forest Utilisation. (1940).

TROUP, R. S.—The Silviculture of Indian Trees. (1921).

VOIGT, J. O.—Hortus Suburbanus Calcuttensis. (1845).

WATT, G.—A Dictionary of the Economic Products of India. (1885). The Commercial Products of India. (1908).

WOODROW, G. M.—Gardening in the Tropics. (1910).

# INDEX OF VERNACULAR & ENGLISH NAMES

(*English and other non-Indian names in italics.*)

Ach . . . 277
Ada . . . 422
*Adam's apple* . . . 85
,, *fig* . . . 423
*African calabash* . . . 45
,, *oil-palm* . . . 446
,, *tulip-tree* . . . 338
Ag . . . 318
Agast, agasthi, agasti, agust, agusta . . . 141
Ajau . . . 95
Ak . . . 277, 318
Akan, akanda . . . 318
Akar kanta . . . 271
Akas nim . . . 333
*Akee fruit* . . . 118
Akol, akola . . . 271, 391
Akond . . . 318
Akrot . . . 391
Akus . . . 366
Al . . . 277
*Alangilang* . . . 11
*Alexandrian laurel* . . . 33
*Almendro* . . . 228
*Aloe wood* . . . 325
Am . . . 134
Amalbed . . . 78
Amaltas . . . 188
Amara . . . 131
Amb, amba, ambli . . . 134, 183
Ambodha . . . 131
Ambolati . . . 385
Ambra . . . 131, 134
*American bully* . . . 287
,, *cabbage-palm* . . . 464
,, *sumach* . . . 165
Amla . . . 385
Amli . . . 183
Amlika . . . 385
Amna, amra . . . 181
Amrit . . . 423
Amrud . . . 244
Amrul . . . 69, 339
Amrut . . . 244
Amultas . . . 188
Anda champa . . . 3, 4
Anjani . . . 234
Ankora, ankura . . . 271
Annatto . . . 18
Aonla . . . 385
Arand, arandi . . . 377
Arasa . . . 328
*Areca-nut palm* . . . 457
*Areca palm* . . . 459
*Areng palm* . . . 455
Aritha . . . 127
Arjan, arjhan, arjun, arjuna, arjunna 234, 260, 326, 374
Ark . . . 318
Arlu . . . 331
*Arnotto* . . . 18
*Ash* . . . 103, 299
Ashaura . . . 73
Ashok . . . 178
Asok . . . 178
Asoka . . . 178
*Asoka tree* . . . 178
Asphal . . . 122
Assar sauna . . . 331
Asud, asvattha . . . 410
Ata . . . 12
Atal . . . 73
Atanni . . . 77
Attara . . . 78
Attah bar . . . 406
*Australian cranberry* . . . 287
,, *oak* . . . 421
*Avocado pear* . . . 358
Azaraki . . . 321

Babla, babul, babur . . . 212
Badahara . . . 401
Badami . . . 228
*Bael, bael-fruit tree* . . . 93
Bagh ankura . . . 271
Bagh bherenda . . . 372
Bagnai . . . 15
Bagphal . . . 141

Bahera, baheri . . . . . . 230
Bahojaman . . . . . . . . 242
Bahubara . . . . . . . . 323
Baigun . . . . . . . . . 328
Bailewa . . . . . . . . . 321
Baili . . . . . . . . . 265
Bajar batul . . . . 434, 438
Bajoura . . . . . . . . 87
Bajur . . . . . . . . . 438
Bajvaran . . . . . . . . 370
Bak . . . . . . . . . 141
Bakain, bakarja, bakarjan, bakayana . . . . . . 104
Bakphul . . . . . . . . 141
Bakul . . . . . . . . . 288
Bala . . . . . . . . . 35
Balkubans . . . . . . . 469
Balnimb . . . . . . . . 101
Balsam of Peru . . . . . 141
*Bamboos* . . . . . . . 467
Ban ach . . . . . . . . 277
*Banana* . . . . . . . . 423
Ban bherenda . . . . . . 372
Bandarlati, bandarlauri . . 188
Bandhuri . . . . . . . . 78
Ban gab . . . . . . . . 293
Bangla badam . . . . . . 228
Ban mahuva . . . . . . . 291
Ban jam . . . . . . . . 284
Ban jhau . . . . . . . . 25
Ban kalla . . . . . . . . 59
Ban naranga, ban naringa . 379
Bans . . . . . . . . . 470
Bansini . . . . . . . . 471
Ban tamaku . . . . . . . 328
Ban tipariya . . . . . . 328
*Banyan* . . . . . . 411, 413
*Baobab* . . . . . . . . 45
Bar . . . . . . . . . 413
Bara bent . . . . . . . 431
Barachand . . . . . . . 277
Bara chali . . . . . . . 7
Bara kukur chita . . . . . 360
Bara mahagni . . . . . . 109
Barahmi . . . . . . . . 36[illegible]
Bara nebu, bara nimbu . . 79, 85
Baranga . . . . . . . . 34
Bara ritha . . . . . . . 126
Bara tagar . . . . . . . 306
*Barbados cabbage-tree* . . . 464
,, *lilac* . . . . . . 104
*Barbados nut* . . . . . . 372
,, *pride* . . . . . . 165
Bargad . . . . . . . . 413
Barhal . . . . . . . . 401
Barial . . . . . . . . . 203
Bari gumchi . . . . . . . 206
Barna . . . . . . . . . 15
Baro . . . . . . . . . 217
Barsanga . . . . . . . . 74
Barun . . . . . . . . . 15
Basini bans . . . . . . . 471
Basna, basta . . . . . . 141
*Bastard cedar* . . . . . . 60
,, *mahogany* . . . . 109
,, *myrabolan* . . . . 230
,, *oleander* . . . . 302
,, *sago-palm* . . . 453
,, *teak* . . . . . 160
Batavi nebu, batornebu . . 88
*Bay laurel* . . . . . . . 358
Bayurbatum nuts, bazarbatu nuts . . . . . . . 436
*Bead tree* . . . . . . 104, 206
*Bedda nut* . . . . . . . 230
*Beefwood* . . . . . . . 421
Beg pura . . . . . . . . 85
Behar bans . . . . . . . 470
Behera . . . . . . . . . 230
Bel . . . . . . 17, 93, 299
Bela . . . . . . . . . 93
Belambu . . . . . . . . 71
Belati (*see* bilati)
*Belgaum walnut* . . . . . 391
*Belleric myrabolan* . . . . 230
*Ben tree* . . . . . . . 137
Benchi . . . . . . . 21, 23
*Bencoolen nut* . . . . . 391
*Bengal kino* . . . . . . 160
,, *quince* . . . . 15, 93
,, *walnut* . . . . . . 391
Ber . . . . . . . . 114, 413
Beri . . . . . . . . . 114
Betain . . . . . . . . . 104
*Betel-nut palm* . . . . . 457
*Betel palm* . . . . . . . 457
,, *vine* . . . . . . . 458
Bhadi . . . . . . . . . 129
Bhaira . . . . . . . . . 230
Bhalkua . . . . . . . . 469
Bhant . . . . . . . . . 349
Bhari . . . . . . . . . 265

Bhendi 39
Bherenda 377
Bheri 265
Bhillar 390
Bhillaura 375
Bhimul 65
Bhindi 35
Bhokar 323, 325
Bhola 35
Bhui okra 349
Bibsar 73
Bijaura 85
Bijori 85
Bila, bilasi 15
Bilati amli 222
,, amluki 220
,, amra 133
,, jhau 421
,, kikar 175, 214
,, nim 333
,, siris 224
Bilayati amra 133
,, babul 214
,, bel 348
,, gab 298
,, imli 222
,, saru 421
,, shisham 154, 380
*Bile tree* 131
Bili 93
Biliana 15
Bilimbi 71
Bilin 90
Bimla 64
Binari 299
Bistendu 293
Bithua 155
*Bitter orange* 78, 83
*Black babool* 212
,, *bean* 164
,, *currant tree* 389
,, *mulberry* 396, 398
,, *myrabolan* 232
,, *nightshade* 328
,, *plum* 242
,, *siris* 219
*Blackwood* 154
Blimbi 71
*Blimbing* 71
*Blinding tree* 382
*Blue gum* 246

Bodula 52
Bogri 114
Bohar 129
Bohari 323, 325
Bohera 230
Bohl 288
Bohodari 323
Bokkan 185
Bola 35, 55
Bolsari 288
Bon (*see* ban)
Bor 114, 413
Bot 413
*Bottle brush* 249
*Bottlebrush oak* 251
*Bottle palm* 463
Boyra 230
*Brab tree* 443
*Brazil cherry* 238
*Brasiletto wood* 167
*Breadfruit tree* 399
*Brinjal* 328
*Broken bones* 331
Buddha narikella 50
*Buddha's coconut* 50
Buhal 323
Buhuru 230
Buka 141
Bukal 288
*Bull bay* 3
Bulla 230
*Bullock's heart* 14
*Burdock* 122
*Burmese pink cassia* 193
,, *rosewood* 151
But 413
*Buttercup tree* 19
*Butter fruit* 298
,, *tree* 291
Byakur 328

*Cabbage palm; cabbage tree* 464
Cajaputi 247
*Cajeput-oil tree* 247
*Cajuputte* 247
*Calabash tree* 348
*Calamondin* 77, 78
*Camel's foot tree* 202
*Campeachy tree* 185
*Camphire* 263, 265
*Camphor, camphor laurel* 363

*Candahar tree* 353
*Candle nut* 391
*Candle tree* 344
*Cannon-ball tree* 257
*Cape gooseberry* 328
*Cape jasmine* 280
*Caper tree* 15
*Cashoo nut tree* 457
*Cassia cinnamon, cassia lignea* 362
*Cassie* 214
*Castor-oil plant* 377
*Catechu palm* 457
*Casuarina* 421
*Cedrat* 85
*Ceylon oak* 121
Chakemdia 155
Chakki 399
Chakotra 88
Chakwa 236
Chalcha 160
Chalita 1
Chalmeri 383
Chalta 1
Chameli 304, 306
Champ, champa, champaka 5, 425
Chandarasa 420
Chandni, chandui 306
*Changeable rose* 37
*Charcoal tree* 393
*Char palm* 443
Chatiun, chatwan 310
Chau 468
*Chebulic myrabolan* 232
Chhangura 86
Chhattin 310
Chhota kichli 77
,, bans 467
Chibbinge 321
Chichra tesu 160
Chikan 393
Chiku 287
Chikun 393
Chil 477
Chilara 265
*Child-life tree* 387
Chilla 265
*Chillies* 327
*China kurab* 302
*China palm* 439, 440
*China tree* 104
*Chinese arbor-vitae* 478
*Chinese box* 73
,, *cherry* 66
,, *date* 114
,, *gooseberry* 70
,, *medlar* 226
,, *tallow tree* 380
Chini champa 425
Chini kamranga 71
Chinni 396
Chir 477
Chuka 374
Chun 396
*Cinnamon tree* 361
*Citron* 76, 79, 80, 85
*Citron-scented gum* 246
*Clammy cherry* 323
*Cocoa nut, coco nut* 431, 448
*Coconut palm* 448
*Cocus wood* 162
*Coffee* 272
*Cokernut* 448
*Colonial pine* 476
*Colville's glory* 172
*Common ash* 299
*Common lilac* 299
*Common orange* 81
*Conessi bark* 308
*Confederate rose* 37
*Coomb teak* 353
*Coorong* 476
*Coral jasmine* 299
,, *pea* 206
,, *plant* 372
,, *tree* 157
*Corkwood* 35
*Cornel* 270
*Coromandel gooseberry* 70
*Cotton tree* 43
*Country almond* 228
*Cowa mangosteen* 30
*Crepe-flower* 260
*Crow fig* 321
*Cucumber tree* 71, 346
*Cuckoo's joy* 134
*Cupid's favourite* 134
*Curd fruit* 90
*Curry-leaf tree* 74
*Custard apple* 12
*Cypress* 474
Dabdabe 99
Dadap 157

Dad mari 259
Daheya, dahia 394
Dahu 401
Dahur karanja 149
Daira 316
Dakai, dakai martaban 425
Dakhani babul 222
Dakur 302
Dalana phul 304
Dalchini 362
Dalim 259
Dalkaramcha 149
*Dark blackwood* 154
Dasaundu 293
*Date palm* 431
*Date-sugar palm* 431
Deb babul 214
Debdar, debdaru 9
Dehua 401
Deikna 104
Dekhani babul 222
Dephal 401
*Desert palm* 443
Deshi badam 228, 254
Desukajhad 160
Devadar 9
Devadaru, devidari 9
Devakanchan 202
*Devil's cotton* 61
*Devil's tree* 310
Dhak 160
Dhamani, dhamin 64
Dhandiain 143
Dhao 401
Dharauli 316
Dholdhak 157
Dhudi 308
Dhunchi 141
Dhutra 328
Dikmali 279
*Dilo oil tree* 33
Dimeri 419
*Dita bark tree* 310
*Divi-divi* 165
Dodan 127
*Dogbanes* 302
*Dogwood* 270
Domba 34
*Dragon's eye* 122
Drek 104
*Drumstick tree* 137
*Drunken date tree* 457
Dudhi 308, 313, 316
Dudhkoraiya 316
Duli champa 4
Dumar 416
*Dung tree* 47
Duria bel 348

*Easter tree* 308
*East Indian rose-bay* 306
,, ,, *walnut* 220
,, ,, *wine palm* 453
*Ebony* 293
Echar 401
*Egyptian privet* 263
*Egg-plant* 328
*Elephant apple* 1, 90
*Elephant's palm* 453
*Elm* 392
*Emblic myrabolan* 385
*Erand, eranda* 377
*Eve's apple* 306
,, *apron* 417
*Exile oil tree* 302
*Eyeball tree* 122

*Fan palm* 434, 443
*Fasel nut* 457
*Fern-leaved jacaranda* 343
*Fern tree, fern-leaf tree* 117
*Fetish tree* 346
*Fig of India* 423
*Figs* 403
*Fingered citron* 87
Firki tagar 306
*Fish-poison tree* 147
*Fish-tail palm* 453
*Flamboyant* 170
*Flame of the forest* 160
*Flame tree* 170
*Florida rough* 77
*Forbidden fruit* 88, 306
*Forget-me-not* 323
*Fountain tree* 338
*Frangipani* 304
*Frywood tree* 219

Gab 295
Gabdi 19
Gabu 244
Gagandhul 428

Gagjaira 409
Gairal 202
Gaiasvattha, gaiaswat 409
Gajahanda 39
Gajanima 78
Gajashundi 39
Gajna 409
Galgal 19
Gamari, gambar 353
Gambar 353, 375
Gandbabul 214
Gandhal rangan 282
Gandharaj 280
Gandhela, gandhla 74
Ganiar 19
*Gardenia* 280
Garbijaur 359
Garso 217, 219
Garur 359
Gausam 121
*Geiger tree* 325
Gejra 19
Gengwa, geo 382
*Geranium tree* 202
Ghadi 129
Ghaul 271
*Ghaut palm* 453
Gheria 382
Ghila 401
Ghogar 99
Ghurga 279
*Giant milkweed* 318
*Ginger* 422
Ginyan 129
Girmalah 188
Girnar 1
Gobla 416
Gobur champ 304
Golab jamb 238
Golainchi 304
*Gold mohur* 151, 170
*Golden apple* 93
" *bamboo* 471
" *champak* 97
" *shower* 188
Golgol 19
*Gomuta fibre* 456
*Gomuti palm* 455
Gondi 323
Gora nebu 79
Gora nim 104
Gorakamali, gorakhamli, gor-
amlichora 45
Gorahingiah 337
Gorur champa 304
Gota begun 328
*Grapefruit* 77
*Great hog-plum* 133
*Green ebony* 162, 343
Gua 457
*Guango* 224
*Guava* 244
*Guaymochil* 222
Guhiya babul 214
Gukikar 214
Gulab jaman 238
Gulachin 304
Gular 419
Gulejafari 299
Gul feringhi 302
Gul-i-ajaib 37
Gul mohr, guli mohur
170, 171, 172, 173, 342
Gumbar 353
*Gum-lac tree* 121
Gundharaj 280
Guneri 19
Gurar 217
Gurial 203
Gurkamai 328
Gurkhi 328
Gurkur 217
Gurtakand 318
Gut begun 328
Gwa 360, 382
Gwiar 203

Haejarad 232
Hajli badam —
Haldi korubi 302
Haldi kunch 277
Hapar mali 302
*Happy tree* 110
Har 232, 299
Harara 232
Hardi 277
Harfarauri 383
Hargesa 1
Hari kakra 158
Harin harra 105
Harin khana 105
Haritaki 232

Hariphal 383
Har kakra 302
Harra 232
Harri 74
Harsinghar 299
Hat 308
Hatisura 323
Hatiya 141
Hattian 41
Hazara 77, 78
*Heliotrope tree* 326
*Henna* 263
Hidjal 252
Hijdaona 369
*Hill palm* 453
Him champa 3
Hindi badam 228
*Hog-plum* 131
*Hollyhock* 34
*Holy fruit* 93
*Honduras mahogany* 108
*Honey tree* 121
*Honey-fruit tree* 60
Honsa nebu 85
*Hoop pine* 476
*Horse cassia* 196
*Horseradish tree* 137
*Horse tamarind* 207
Hurhuria 15

Id 78
Ijal 252
Ijjul 251
*Ilachie* 247
*Ilang-ilang* 12
Imli 183
Ind 377
Indarjau 313
*Indian almond* 228
,, *amulet plant* 387
,, *beech* 149
,, *blackberry* 242
,, *caoutchouc tree* 406
,, *cherry* 114, 323
,, *cork-tree* 333
,, *fir* 9
,, *gum-arabic tree* 212
,, *jujube* 114
,, *laburnum* 188
,, *lilac* 101, 104
,, *lime* 83
*Indian mahogany* 110
,, *medlar* 288
,, *mourner* 299
,, *mulberry* 277, 397
,, *nettle tree* 393
,, *nut tree* 457
,, *oak* 251, 252, 350
,, *plum* 114
,, *privet* 263, 355
,, *quince* 93
,, *rosewood* 154
,, *sago-palm* 453
,, *shot* 422
,, *tree-spurge* 366
,, *trumpet-flower* 331
,, *wild pepper* 356
,, *wine-palm* 431
Indrajau 313
Ingar 252
Irum 390
*Ivory tree* 308

*Jack tree* 399
*Jaggery palm* 453
Jagya dumar 419
Jaheva 25
Jaint, jait 143
Jaipal 373
*Jamaica dogwood* 147
,, *ebony* 162
Jam, jaman 242
Jambhiri 77
Jambira 79
Jambol 242
*Jambosade* 238
Jamla 234
Jamni phalani 242
Jamrul 239
Jamun 242
Jangal badam 47
Jangli akrot 391
Jangli arandi 372
Jangli badam 47, 228
Jangli jhau 421
Jangli moha 291
Jangli saru 421
Janjhan 143
*Japan camphor tree* 363
*Japanese cherry* 66
*Japan medlar* 226
*Japan quince* 226

Jarul 260, 262
*Jasmine tree* 304
Jaura 25
*Java cassia* 192
,, *cedar* 390
,, *fig* 404
,, *plum* 242
,, *willow* 404
Jayanti 143
Jaya pala 373
*Jerusalem thorn* 175
Jet 143
Jhau, jhav 25
Jhijam 143
Jhingan 129
Jial 129
Jiaputa 387
Jilan 393
*Jimbling* 383
Jiol 129
Jir 129, 405
Jival 129
Jivputrak 387
Joba 35
Jog dumur 416
Jowa 468
Jujar 252
Jum 99
*Jumrool* 239
*Junipers* 474
Jupong 393
Juti 73, 387

Kabar 409
Kabuli kela 423
*Kachita* 321
Kachkela, kachkula 423
Kachnar 202, 203
Kadam, kadamb 273
Kaggi nimbu 83
Kagsha 416
Kaghzi nimbu 83
Kahimal 407
Kahu 234
Kahua 234
Kaikar 99
Kain 390
Kait, kaith, kaitha 90
Kaith Bilin 90
Kajar 431
Kajra 321
Kak dumar 416
Kakki 65
Kakria 160
Kakuri 360
Kala 423
Kala jam 242
Kala tendu 295
Kaliar 202
Kalshish 219
Kalsis 217
Kamala 80, 81, 366
Kamala nebu 80, 81
Kamarak 70
Kamarakha 70
Kamaranga 70
Kamba 254
Kamela 266
Kamlai 129
Kamini 73
Kamrak 70
Kamranga 70
Kamrup 405
Kanak champa 57
Kana raj 203
Kanchan, kandan 202, 203
Kaner 302
Kaniar 57
Kanja 149
Kankrei 160
Kanmar 127
Kanta bans 470
Kanthal 399
Kanti sembal 43
Kaphur 363
*Kapok tree* 41
Karabi 301
Karail 473
Karam 273
*Karambola apple* 70
Karamcha 301
Karanj, karanja 149
Karanji 217
Karchanna 394
Karchi 308
Karhar 217
Kari 308, 360
Kariaphulli 74
Karkapilly 222
Karkath 331
Karkawa 360

Karmuj 149
Karna 78, 86
Karna nebu 79
Karo 217
Karra 64, 308
Karva indarjhau 308
Kashmala 129
*Kashmir tree* 353
Katan 41
Katathohar 368
Katausi 470
Katbel 90
Kat gular 416
Kathal 399
Kathbel 90
Kath bewal, kath bimla 65
Kath champa 33, 57
Katmarra 360
Katnim 74
Kattang 470
Katu 117
Kau 30
*Kavika tree* 241
Kavitha 90
Kawa 234
Kawla 77
*Kayaputi* 247
Kea 428
Keiya 428
Keiya kanta 428
Kejur 431
Kela, keli 423
Keol 407
Keora, keori 428
Keonla 77, 81
Kerui 366
Ketgi 428
Ketkikeya, ketuki, ketua 428, 470
Keura 428
Khabar 407
Khairwal 202
Khaji, Khajur, Khajuri 431
Khamara 353, 375
Kharpat 99
Khatta 78, 86
Khatti 77
Khawari 149
Khayar 209, 211
Khirni 313
Khudijamb 389
Khujja 401
Khumbi 254
Khwairal 203
Kiamil 129
Kichli 78
Kikar 212
Kikoa 362
Kikra 362
Kimul 129
Kiramal 149
Kiranti 468
Kirkiria 362
*Kittul tree* 453
Kobitha 90
Koda 326
Koeli 271
Koha 234
Koiral 202
Kokilphul 302
Koliar 203
Kolkaphul 302
Kondai 23
Konpahlsehnd 366
Kora 308
Koroi 217
Kosum 121
Kota gandhal 282
Kotki kanta 428
Kotsemba 390
Kowa 30
Krishna chura 165
Kuar 308
Kuchala 321
Kurchi kanta 205
Kuchila 321
Kuchla 321
Kudumi 8
Kukur chita 359
Kula aja 326
Kulgachh 114
Kulkiphul 302
*Kumaon pine* 477
Kumb, kumbh 254
Kumbhar 353
Kumbi, kumhi 254
Kumia 252
*Kumquat* 78
Kumul 61
Kunda 251, 299
Kural 203
Kurchi, kureya 308, 314
Kuri 299

Kurkuna 326
Kusum 121, 161
Kutla 85

*Lac tree* 121
*Ladies' fingers* 35
Ladoo 77
Lajuk 205
Lakhota 226
Lakuch, lakucha 401
Lal ak 318
Lal jhav 27
Lal madar 318
Lankasij 366
*Large-flowered nightshade* 329
*Large-leaved mahogany* 109
Lashora, lasora 323
Lasrin 219
Latadaona 366
Latkan, latkhan 18
*Laurels* 358
*Laurel magnolia* 3
*Lead tree* 207
Lebu 83
Lelka 419
*Lemon* 76, 79, 88
*Lemon-scented eucalypt* 246
*Lemon verbena* 246
*Lilac* 299
*Lily tree* 3
Lim 110
Limbado 95
Limbu 83
*Lime tree-leaved hibiscus* 35
Limun 83
Litchi, litchu 124
Loda 383
Logat 226
*Logwood* 185
Loha jangia 282
Lohar 129
Lohari 293
*Longan* 122
*Long-leaved pine* 477
*Looking-glass tree* 53
*Loose-skinned orange* 76, 77, 80, 82
*Loquat* 226
*Lucky bean* 302, 387
Lud 110
*Lumbang nut* 391
*Lumia* 79
Luna 12
Luvuni 14

*Mabola* 298
Madhankri, madhkunkur 87
Madar 318, 401
*Madras thorn* 92, 222
*Madre tree* 146
*Madura shade tree* 146
Magar bans 470
Mahagni 107
Mahalimbu 110
Mahanibu, mahanimbu 88
Mahanim 95, 104, 110
Maharukh 95
*Mahogany* 107
Mahua, mahula, mahuva, mahwa 291
Maida, maidalakri 359
Makrichijhar 282
Makur kendi 295
*Malabar almond* 228
Malaka jamrul 241
*Malay almond* 228
,, *apple* 238, 241
,, *rose-apple* 241
,, *sago palm* 455
Malayajam 241
*Malayan fern palm* 481
*Male bamboo* 473
Mandania 176
Mandara 157
*Mandarin* 77
*Mango* 134
*Mangosteen* 29
*Manilla tamarind* 222
Mansasij 369
*Many-spined flacourtia* 22
Marchula 73
Marda 360
*Margosa tree* 101
Mari, mari-ka-jhad 453
Martaban 425
*Mast tree* 9
Matela bans 468
Mathirshi 219
Maul 291
Maulser 288
*Mazeberry* 287
Meba 12

Meda . . . . . . . . . . 360
Medh . . . . . . . . . . 359
*Medicinal cabbage tree* . . . 457
Mehndi . . . . . . . . . 263
*Melon tree* . . . . . . . 267
Menda . . . . . . . . . . 359
Mendi . . . . . . . . . . 263
Mesta . . . . . . . . . . 35
Mewri . . . . . . . . . . 355
*Mhar palm* . . . . . . . 453
*Midday marvel* . . . . . . 331
*Midnight horror* . . . . . 331
*Mignonette tree* . . . . . 263
*Milk bush, milk hedge* . . 360
*Mimosa-leaved jacaranda* . . 341
Mini chambeli . . . . . . 333
Mirich . . . . . . . . . 327
Mitenga . . . . . . . . . 468
Mitha nebu . . . . . . . . 79
Mitha indarjau . . . . . 313
*Mochi wood* . . . . . . . 157
Mohin . . . . . . . . . . 129
Mohwa . . . . . . . . . . 291
Moishkanda . . . . . . . 293
Mom china . . . . . . . . 380
*Monkey bread* . . . . . . 45
,, *fruit* . . . . . . . 90
,, *jack* . . . . . . . 401
*Monkey-pot tree* . . . . . 250
*Monkey puzzle* . . . . . . 475
More panki . . . . . . . 478
*Moreton Bay chestnut* . . . 164
,, ,, *pine* . . . . 476
*Mother of cocoa* . . . . . 146
*Motooi* . . . . . . . . . 11
*Mottled ebony* . . . . . . 293
*Moulmein cedar* . . . . . 110
*Mountain ebony* . . . . . 202
,, *glory* . . . . . 463
,, *rata* . . . . . . 249
Mowen . . . . . . . . . . 129
Moyna . . . . . . . . . . 129
Muchkand, muchukunda . . 56
Mula . . . . . . . . . . 52
*Mulberry* . . . . . . . . 396
Mulsari . . . . . . . . . 288
Multa . . . . . . . . . . 388
*Mundani* . . . . . . . . 176
Mungna . . . . . . . . . 137
*Musket tree* . . . . . . . 60
Muskunda . . . . . . . . 56

Nagalingam . . . . . . . 257
Nagesar, nagkesar . . . . 31
Nairyal . . . . . . . . . 448
Nal bans . . . . . . . . 470
Naranga, narangi, naranj 80, 81
Narakel, narel . . . . . . 448
Naringhi . . . . . . . . 81
Narial, nariel, narikel, nariyel, narkul . . . . . . . . 448
Narungi . . . . . . . . . 81
Nasona . . . . . . . . . 331
Nata karanj . . . . . . . 165
Nebu . . . . . . . . . . 83
*Neem tree* . . . . . . 75, 101
*Neesberry* . . . . . . . 287
*Negro's olive tree* . . . . 232
Nengar . . . . . . . . . 355
Neora . . . . . . . . . . 252
*Nero's crown* . . . . . . 306
Nevari . . . . . . . . . 282
*New Caledonia pine* . . . 475
Nibari . . . . . . . . . 299
*Nicobar bread-fruit* . . . 428
*Night-flowering jasmine* . . 299
Nil bhadi . . . . . . . . 99
*Nile tulip tree* . . . . . 340
Nim, nimb, nimgachh . . . 101
Nimbu . . . . . . . . . . 83
Nind . . . . . . . . . . 101
Nipal tunth . . . . . . . 60
Nirgandi, nirgundi . . . . 355
Nirmal . . . . . . . . . 321
Nishinda . . . . . . . . 355
Noari . . . . . . . . . . 383
Nona . . . . . . . . . . 14
Non ata . . . . . . . . . 14
Nori . . . . . . . . . . 383
Nubari . . . . . . . . . 383
Nuli . . . . . . . . . . 183
Nun bhantur . . . . . . . 366
*Nux-vomica tree* . . . . . 321

Ola . . . . . . . . . . . 328
*Olive* . . . . . . . . . 299
*Opoponax* . . . . . . . . 214
*Orange jasmine* . . . . . 73
*Otaheite apple* . . . . . . 133
,, *cashew* . . . . . 249
,, *gooseberry* . . . . 383

*Padauk* . . . . . . . . . 151

Padrian 203
Pagla gachh 52
*Pagoda tree* 304
Pagun 43
Pahari nimbu 79
Paiman 242
Pakar 407, 409
Pakharia 407
Pakri 407
Pakur 404, 407
Palaka jui 282
Palas, palashpapra 160
Palita mandar 157, 459
Pallam 315
*Palma Christi* 377
*Palmiste* 463
*Palms* 443
Palmyra palm, 443
Palte madar 157
Panasa 399
Panden 326
Pangara, pangra 157
Pania 326
Paniala 22, 390
Paniamalak 22
Paniaonla 22
Pani-ka-sanbhalu, pani-samalu, pani sanbhaki 356
Pani sara 64
Panjira 157
Pankain 390
Panniari 252
Panos 399
Panthopadop 426
Papar 149
Papaya 267
*Papaw, papaya* 267
*Paper mulberry* 398
Papeya, papita 267
Papra 279
Papria 360
*Paradise apple* 88
Paras, paras pipal, parsipu 39
Paroa 419
*Parrot tree* 160, 219
*Passion flower* 267
Patajhau 478
Patang 185
Patasij 369
Patigia, patji 387
Patoia 360
Patti badam 228
Patti nimbu 83
Pattonkisend 369
*Peach* 226
*Peach bloom* 298
*Peacock flower* 170
*Peacock tree* 206
*Peepul* 410
*Peka* 468
Pepiya, pepe 267
*Perennial Indian hemp* 61
*Periwinkles* 302
*Persian lilac* 104
*Persimmon* 293
Phalasah, phalsa 64
Phalinda 242
Pharad 157
Pharkath 331
Pharoah, pharsa 64
Pharsi 331
Phaunda 242
Phulsa 64
*Physic nut* 372
Pila, pilakanir 302
Pilkhan 407
*Pinang palm* 457
Pindara 375
*Pine* 477
*Pink cassia* 190
,, *cedar* 176
,, *mohur* 190
,, *shower* 196
Pinnay 34
Pipal, pipli 410
Pippiya 267
Pissi babul 214
Pitali 375
Pitraj 105
Piyar, piyara 244
*Plantain* 423
*Poinsettia* 366
*Poison nut* 321, 372
Polashi 160
*Pomegranate* 260
*Pompelmos, pompoleon* 88
*Poncire* 87
*Poonga oil plant* 149
Poras, porush 39
*Portia tree* 39
*Potato* 328
*Potato tree* 328, 349

*Pride of China* 104
,, ,, *India* 104, 260
*Procumbent oxalis* 69
*Pudding pipe* 188
Pula 34
*Pumelo* 76, 77, 82, 88
Pun 34
Puna 326
*Puneala plum* 22
Punjlawai 326
*Punk tree* 247
Punnag 33
Punyan 326
*Purging cassia* 188
,, *nut* 372
*Purple loosestrife* 259
Putajan, putijia, putrajiva, putranjiva 387
Putri 374
Puveras 117

*Queen flower* 260

Ragatsemal 43
*Rain tree* 224
Rakhal phul 116
Rakta chandana 206
,, jhau 27
,, kambal 206
,, kamhar 203
,, kanchan 202, 206
,, madar 157
,, simal 43
*Rambong* 406
Ramkela 425
Ramphal 14
Rand 377
Randkari 360
Rangan 282
*Rangpur lime* 79
Ranjana 206
Rasalla 323
Rasin 143
*Rattan cane* 431
Ratun 359
*Red bottle-brush* 249
,, *cassia* 195
,, *cedar* 176
,, *Indian laburnum* 195
,, *jasmine* 304
,, *sandalwood* 206
*Red silk-cotton tree* 43
,, *wood* 206
Reshmi, reshni 77
Ritha 126, 127
*River ebony* 295
,, *poison* 382
Ronch 277
*Rose* 226
,, *apple* 238
,, *of China* 35
,, ,, *Venezuela* 180
*Roucou* 18
*Rough chaff* 287
*Royal palm* 463
*Rubber tree* 406
*Rue* 73
Rusa 394
*Rusty shield bearer* 167

Sadaphal 88
Safed ak 318
,, ind 372
,, safari 244
,, sanbhalu 356
,, simal 41
,, siris 217
Safri am 244
Sagon 350
Sagona 230
*Sago palm* 455, 456
Sagun, sagwan 350
Sahajna 137
Sahora 394
Saihari 299
Sai kanta 211
Sainjna 137
Saitanka jhad 310
Sajina, sajna 137
Sakhu 350
Salma 431
Salsain babul 209
Samalu 355
*Saman* 224
Samari 52
Sambal 41
Sambhal 355
Samudra, samundar 251, 252
Sanbhalu 355
*Sandal neem* 110
Sandbhalu 355
Santhra 80

Saonjna . . . . . . . . . 137
*Sapodilla plum* . . . . . . 287
Sapota . . . . . . . . . 287
*Sapota plum* . . . . . . . 287
Sarbajaya . . . . . . . . 422
Saripha . . . . . . . . 12
*Satin wood* . . . . . . . 73
Satni . . . . . . . . . . 310
*Satsuma orange* . . . . . . 78
Satwin . . . . . . . . . 310
Saukanta . . . . . . . . 211
Sauna . . . . . . . . . . 331
*Sausage tree* . . . . . . . 346
*Scarlet bell tree* . . . . . . 338
,, *cordia* . . . . . . . 325
*Scented babool* . . . . . . 214
*Screw pine* . . . . . . . . 428
*Sebesten* . . . . . . . . . 323
*Sebesten plum* . . . . . . 325
Segun . . . . . . . . . 350
Segva . . . . . . . . . . 137
Sehnd, sehud, sehund . 366, 369
Semur . . . . . . . . . . 43
Sendhi . . . . . . . . . . 431
Senhur . . . . . . . . . . 368
*Senna tree* . . . . . . . . 151
Senibal . . . . . . . . . 41
Seoli . . . . . . . . . . 299
Sephalika . . . . . . . . 299
Seville orange . . . . 78, 83
Sewan . . . . . . . . . 353
*Shaddock* . . . . 76, 88
Shahetuta . . . . . . . . 396
Shajna' . . . . . . . . . 137
Shalapara . . . . . . . . 37
Shatuttursh . . . . . . . 396
*She oak* . . . . . . . . . 421
Sherawane . . . . . . . . 23
Shiah kanta . . . . . . . 205
Shibjhul . . . . . . . . 116
Shibgachh . . . . . . . . 370
Shimbal . . . . . . . . . 43
*Shingle tree* . . . . . . . 176
Shiora . . . . . . . . . 394
*Ship tree* . . . . . . . . 350
Shirthohar . . . . . . . . 366
Shisham . . . . . . . . . 152
Shivalingam . . . . . . . 257
Shiwari . . . . . . . . . 355
Shukri . . . . . . . . . 64
*Siamese rough bush* . . . . 394
Siharu . . . . . . . . . . 299
Sij . . . . . . . . . 368, 369
Silkanti . . . . . . . . . 362
Silkoroi . . . . . . . . . 216
*Silky oak, silver oak* . . . . 365
Simal . . . . 41, 42, 43, 48
Sindhuka, sinduari . . . . . 355
*Singapore cedar* . . . . . . 110
Singhar . . . . . . . . . 299
Singran . . . . . . . . . 360
Singrauf . . . . . . . . . 359
Siora . . . . . . . . . . 394
Sirai, sirar, sirin, siris, sirissa,
sirsa . . . . . . . . . 219
Sirphal, siriphal . . . . . . 93
Sissai, sissoo, sissu, sisu . . 152
Sitaphal . . . . . . . . . 12
Sitsal . . . . . . . . . . 154
*Sizzling tree* . . . . . . . 219
*Slow-match tree* . . . . . . 254
*Small Indian oak* . . . . . . 252
*Smyrna fig* . . . . . . . . 417
*Soapnut* . . . . 122, 126, 127
Soh quid, soh quit . . . . . 79
Somr . . . . . . . . . . 43
Sona . . . . . . . . . . 331
Sonali . . . . . . . . . . 188
Sondna . . . . . . . . . . 137
Sonpatti . . . . . . . . . 331
Sontara . . . . . . . . . 80
*Sorrowful tree* . . . . . . 299
*Sour gourd* . . . . . . . . 45
,, *lime* . . . . . . 77, 79, 83
,, *sop* . . . . . . . . . 12
*South Indian redwood* . . . 152
*Spanish mahogany* 107, 108, 109
Sphalpadma . . . . . . . . 37
*Spiny bamboo* . . . . . . . 470
*Sponge tree* . . . . . . . . 214
*Spring tree* . . . . . . . . 134
*Spurges* . . . . . . . . . 366
*Squirt tree* . . . . . . . . 338
*Sritalam* . . . . . . . . . 434
*St. John's-wort* . . . . . . 28
*Star gooseberry* . . . . . . 383
Sthalkamal . . . . . . . . 37
*Stinkwood* . . . . . . . . 256
*Stone apple* . . . . . . . 93
*Strychnine tree* . . . . . . 321
Sufed (*see* safed)
Sugandabala . . . . . . . . 306

*Sugar apple* . . . . 12, 14
,, *palm* . . . . 431, 455
Sujuna . . . . . . . . 137
Sukri . . . . . . . . . 64
Sultana champa . . . . . . 33
*Sumatra box* . . . . . . 73
Sundari, sunder, sundri . . 53
Suntara . . . . . . . . 76
Supari, supyari . . . . . . 457
*Supari palm* . . . . . . 457
Surgi . . . . . . . . . 31
*Surinam cherry* . . . . . 238
Suringi . . . . . . . . 31
Surpan, surpunka . . . . . 33
*Swallow-wort* . . . . . . 318
*Swamp mahogany* . . . . 246
,, *pea* . . . . . . . . 141
,, *tea tree* . . . . . . 247
*Sweet lime* . . . . 77, 79
,, *orange* . . . . 77, 81
,, *sop* . . . . . . . . 14
Swet akond . . . . . . . 318
,, joba . . . . . . . 35
,, kanchan . . . . . . 203
,, simal . . . . . . . 41
Syona . . . . . . . . . 331

Tad . . . . . . . . . . 443
Tagar, taggai, taggar . . 306
Takoli . . . . . . . . 155
Tal, tal gachh . . . . . . 442
Tali . . . . . . . 152, 434
*Talipot palm* . . . . . . 434
Talispatri . . . . . 22, 362
Tallier . . . . . . 434, 436
Tamaku . . . . . . . . 328
*Tamarind* . . . . . . . 183
*Tamarisk* . . . . . . . 25
Tambolli . . . . . . . . 326
Tamrulhindi . . . . . . . 183
Tanaka . . . . . . . 77, 79
*Tangelo* . . . . . . . . 79
*Tangerine* . . . . . . . 77
Tantia . . . . . . . . . 219
Tar . . . . . . . . . . 442
Tara, tarit . . . . . 434, 436
Tarkajhar . . . . . . . 442
*Tavola nut* . . . . . . . 228
*Teak* . . . . . . . . . 350
Tejapat, tejpat . . . . . 362
Telinga china . . . . . . . 260
Tendu . . . . . . . 293, 295
Tentul, tetai . . . . . . . 183
*Texas umbrella tree* . . . . 105
Tezpat . . . . . . . . . 362
Thaila . . . . . . . . . 271
Thakil . . . . . . . . . 431
Thalkesur . . . . . . . . 321
Thalma . . . . . . . . . 431
Thalpadma . . . . . . . . 37
Thanella . . . . . . . . . 279
Thohar, thohra . . . 366, 369
Thor . . . . . . . . 368, 425
*Thorny bamboo* . . . . . . 470
*Three-leaved pine* . . . . 477
Thuhar, thura . . . . . . 368
*Tight-skinned orange* 77, 78, 81
Tikata sij . . . . . . . . 370
Tikta raj . . . . . . . . 105
Tikta shak . . . . . . 15, 95
Timla . . . . . . . . . . 417
Tim toa . . . . . . . . . 389
Tindhara sehund . . . . . 370
Tindu . . . . . . . . . . 295
*Tinian pine* . . . . . . . 421
Tintil, tintiri . . . . . . . 183
Tipariya . . . . . . . . . 328
Tirmal . . . . . . . . . . 417
Tita indarjhau . . . . . . 308
*Tobacco* . . . . . . . . . 328
*Toddy palm* . . . . . 443, 453
*Tomato* . . . . . . . . . 328
*Toon* . . . . . . . . 110, 128
*Torch tree* . . . . . . . 282
*Torchwood tree* . . . . . . 19
Totmila . . . . . . . . . 416
*Traveller's delight* . . . . 131
,, *palm* . . . . . 426
,, *tree* . . . . . 426
*Tree antigonon* . . . . . . 55
,, *bean* . . . . . . . . 202
,, *jasmine* . . . . . . . 333
,, *of Damocles* . . . . . 331
,, ,, *heaven* . . . . . . 181
,, ,, *sadness* . . . . . . 299
*Trincomali wood* . . . . . 68
*Tropical almond* . . . . . 228
*True oil palm* . . . . . . 446
*Trumpet flower* . . . . . . 302
Tue . . . . . . . . . . . 419
Tugur . . . . . . . . . . 306

Tul . . . . . . . . . . . 396
Tula . . . . . . . . . . 43
Tulda . . . . . . . . . . 468
*Tulip tree* . . . . . 39, 338
Tulklu . . . . . . . . . 396
Tum . . . . . . . . . . 99
Tumri . . . . . . . . . 375
Tun, tuna . . . . . . . . 110
*Tung oil* . . . . . . . . 391
Tuni, tunna . . . . . . . 110
Tunkajhar . . . . . . . . 110
Tunt . . . . . . . . . . 396
Turanj . . . . . . . . . 85
Turunj . . . . . . . . . 86
Tut, tutri . . . . . . . . 396

*Uauassu palm* . . . . . . 452
Udal, udar . . . . . . . 49
*Uganda flame tree* . . . . 340
Uguru . . . . . . . . . 382
Ulatkambal, ulatkambat,
ullatkumul . . . . . 61
Ullu . . . . . . . . . . 331
Umar . . . . . . . . . . 419
*Umbrella tree* . . . 39, 428
Umrai . . . . . . . . . 419
Umtoa . . . . . . . . . 389
Undi . . . . . . . . . . 33
Urusa . . . . . . . . . 328

Vakamba . . . . . . . . 254
Varvunna . . . . . . . . 15
Vatkana . . . . . . . . 18
*Velvet apple* . . . . . . 298
*Vervain* . . . . . . . . 349
Vi . . . . . . . . . . . 133
Vilayati (*see* bilayati)
Vilva . . . . . . . . . . 93
*Vinegar wood* . . . . . . 390

Walena . . . . . . . . . 52
*Watson pumelo* . . . . . 77
*Wax flower* . . . . . . . 306
,, *jambu* . . . . . . . . 239
*West Indian cedar* . . . . 390
,, ,, *blackthorn* . . 214
,, ,, *gooseberry* . . 383
,, ,, *mountain rose* . 180
*White babool* . . . . . . 207
,, *bottlebrush* . . . . 247
,, *cotton tree* . . . . 41
,, *mulberry* . . . . . 396
,, *murdah* . . . . . . 234
,, *siris* . . . . . . . 217
,, *teak* . . . . . . . 353
Wilayati (*see* bilayati)
*Wild date palm* 431, 443, 447, 482
,, *guava* . . . . . . . 254
,, *mango* . . . . . . . 131
,, *olive* . . . . . . . 387
*Willow fig* . . . . . . . 404
*Wine palm* . . . . . . . 453
*Woman's tongue* . . . . . 219
*Wood apple* . . . . . . . 90
*Wood-sorrel* . . . . . . . 69

Yajna dumar . . . . . . . 419
*Yellow areca palm* . . . . 459
,, *bamboo* . . . . . 471
,, *champa* . . . . . 5
,, *elder* . . . . . . 335
,, *gold mohur* . . . . 167
,, *oleander* . . . . . 302
,, *silk-cotton* . . . . 19
Yeonla . . . . . . . . . 385
*Ylang-ylang* . . . . . . . 11

Zakum . . 366, 368, 369, 370
Zardkunel . . . . . . . . 302
*Zither-wood* . . . . . . . 357

# INDEX OF BOTANICAL NAMES

*(Families and genera described in the text in CAPITALS.)*

*(Synonyms in italics.)*

- ABROMA 61
  - augusta 61
- ACACIA 209
  - arabica 209, 212, 216
  - auriculiformis 211
  - concinna 209
  - *Farnesiana* 214
  - Catechu 209, 211, 212
  - moniliformis 209
  - Suma 209, 211, 212
  - tomentosa 209
- ACHRAS 286
  - Zapota 286, 287
- ACROCARPUS 176
  - fraxinifolius 176
- ADANSONIA 45
  - digitata 45
- ADENANTHERA 205
  - pavonina 206
- AEGLE 93
  - Marmelos xvi, 17, 93
- *Aeschynomene grandiflora* 141
- *,, Sesban* 143
- AILANTHUS 95
  - excelsa 95
- ALBIZZIA 216
  - Lebbek 219
  - lucida 216
  - procera 217
  - Richardiana 220
- ALANGIUM 270
  - *hexapetalum* 270
  - *lamarckii* 270
  - salvifolium 270
- Allamanda cathartica 302
- Allophyllus serratus 116
- ALSTONIA 310
  - macrophylla 312
  - scholaris 310
- Althea rosea 34
- ALEURITES 391
  - Fordii 391
  - moluccana 391
  - *triloba* 391
- AMHERSTIA 181
  - nobilis 181
- Ammannia baccifera 259
- *Amoora polystachya* 105
- *,, Rohutika* 105
- ANACARDIACEAE 129
- Anacardium occidentale 129
- Anchusa 323
- *Andersonia Rohutika* 105
- *Andrachne trifoliata* 390
- ANNONA 12
  - muricata 12
  - reticulata 14
  - squamosa 12, 15
- ANOGEISSUS 235
  - acuminata 236
  - pendula 235
  - latifolia 235
- ANONACEAE 7
- ANTHOCEPHALUS 272
  - *Cadamba* 273
  - indicus 273
- ANTIDESMA 388
  - diandrum 388
  - Ghaesembilla 388
  - *paniculata* 388
- Antigonon leptopus 55
- APOCYNACEAE 301
- Apocynum 302
- APPANAMIXIS 105
  - polystachya 105
- ARAUCARIA 474
  - Bidwillii 475
  - Cookii 475, 476, 477
  - Cunninghamii 476
  - imbricata 475
- ARDISIA 283
  - *humilis* 284
  - solanacea 284
- ARECA 457
  - Catechu 457
  - *lutescens* 459
  - *madagascariensis* 460

ARENGA 455
  pinnata 455
  *saccharifera* 455
ARTOCARPUS 399
  integra 399
  *integrifolia* 399
  Lakoocha 401
ASCLEPIADACEAE 317
Asclepias curassavica 318
*Asclepias gigantea* 318
Atlantia monophylla 73
ATTALEA 451
  speciosa 452
AVERRHOA 69
  Bilimbi 71
  Carambola 70
AZADIRACHTA 101
  indica 75, 101, 103, 409

BAMBUSA 467
  arundinacea 470
  Balcooa 469
  nana 467
  *spinosa* 470
  Tulda 468
  vulgaris 471
Bambuseae 467
BARRINGTONIA 251
  acutangula 252
  racemosa 251
Bassia latifolia 291
BAUHINEA 201
  acuminata 202
  *candida* 203, 204
  Galpinii 202
  monandra 202
  Petersiana 202
  purpurea 202, 204
  sulphurea 202
  tomentosa 202
  *triandra* 202
  Vahlii 202
  variegata 203
Beaumontia grandiflora 301
*Bergera Koenigii* 74
BERRIA 68
  cordifolia 68
*Bignonia indica* 331
  *,, suberosa* 333
Bignonia venusta 331
BIGNONIACEAE 330
*Biota orientalis* 478
BISCHOFIA 390
  javanica 390
BIXA 18
  Orellana 18
BIXACEAE 18, 21, 265
BLIGHIA 118
  sapida 118
Bombacaceae 34
*Bombax Ceiba* 43
  ,, *Gossypium* 19
  ,, *heptaphyllum* 43
  ,, *malabaricum* 20, 43
  ,, *pentandrum* 41

BORAGINACEAE 323
Borago officinalis 323
BORASSUS 442
  flabellifer 434, 442
  *flabelliformis* 442
BROUSSONETIA 398
  papyrifera 398
BROWNEA 180, 182
  coccinea 180
  grandiceps 180
BRYA 162
  Ebenus 162
*Buboma tomentosa* 60
Buddleia 321
Buboma tomentosa 60
Bursera 99
BURSERACEAE 99, 117
BUTEA 159
  *frondosa* 160
  monosperma 160
  superba 159
Buxus sempervirens 74

Cactus 366, 371
CAESALPINEA 165
  Bonducella 165
  Cacalaco 167
  coriaria 165
  *inermis* 167
  pulcherrima 165
CAESALPINIEAE 140, 165
Calamus viminalis 431
*Calisaccion longifolium* 31
CALLISTEMON 249
  lanceolatus 249
  salignus 249

CALOPHYLLUM 32
  inophyllum 33, 406
*Calosanthes indica* 331
CALOTROPIS 318
  gigantea 318
  procera 320
Calysaccion longifolium 31
*Camphora officinarum* 363
CANANGA 11
  odorata 11
*Canangium odoratum* 11
Canna indica 422
CAPPARIDACEAE 15
Capparis 15
Capparis horrida 15
Capsicum 327
Cardiospermum Halicacabum 116
CAREYA 254
  arborea 254
  herbacea 254
CARICA 267
  Papaya 267
CARICACEAE 267
  Carissa Carandas 301
  ,, spinarum 301
CARYOTA 453
  urens 453
CASEARIA 265
  tomentosa 265
CASSIA 187
  alata 187
  alipurensis 188
  *bacillus* 192
  Fistula 187, 188, 193
  glauca 187, 199
  grandis 187, 196
  javanica 187, 188, 192, 193, 194
  Lancasteri 188
  marginata 188, 195
  moschata 187, 188
  multijuga 187, 197
  nodosa 187, 188, 190, 192, 193, 194
  orientalis 187
  renigera 188, 193
  *Roxburghii* 195
  siamea 187, 198
  Sophera 187
  Tora 187
CASTANOSPERMUM 141, 163
  australe 164
CASUARINA 420
  equisetifolia 421
  *muricata* 421
CASUARINACEAE 420
Catesbaea spinosa 272
CEDRELA 110
  Toona 110, 128
Cedrus Deodara 10
CEIBA 41
  pentandra 41, 44
CELASTRACEAE 112
Celastrus 112
*Celtis orientalis* 393
Cerbera fruticosa 302
Cerbera Odollam 302
*Chalcas paniculata* 73
CHRYSALIDOCARPUS 459
  lutescens 459
  madagascariensis 460, 466
CICCA 383, 385
  acida 383
  *disticha* 383
CINNAMOMUM 361
  Camphora 363
  Tamala 361, 362
  zeylanicum 361, 362
CITHAREXYLUM 357
  quadrangulare 357
  *spinosum* 357
CITRUS 73, 75, 92
  *acida* 83
  aurantifolia 77, 79, 82, 83
  Aurantium 78, 81
  *Bergamia* 83
  chrysocarpa 76, 77, 79, 80 82
  crenatifolia 77
  decumana 82, 88
  deliciosa 77
  grandis 76, 77, 79, 88
  Hystrix 79
  *ichangensis* 79
  Jambhiri 77
  *japonica* 78
  Karna 78, 79
  *Khasia* 80
  *Lima* 83
  Limetta 79
  limettioides 77, 79
  Limon 76, 79, 88
  Limonia 79
  macroptera 79

maderaspatana 78
medica 76, 79, 82, 83, 85
megaloxycarpa 78
microcarpa 77, 78
Natsudaidai 77
Paradisi 77
paratangerina 77
pennivesiculata 78
Reshni 77
rugulosa 77
sinensis 77, 78, 81
tangerina 77
Unshiu 78
Cleome viscosa 15
Clerodendron infotunatum 349
Cocos 448
nucifera 448
plumosa 448
*Coccothrinax borbadensis* 441
COCHLOSPERMUM 19
Gossypium 19
Codiaeum 374
Codiaeum variegatum 366, 374
Coffea arabica 272
COLVILLEA 172
racemosa 172, 174
COMBRETACEAE 228
Combretum 228
CONIFERAE 474
*Conocarpus acuminata* 236
CORNACEAE 270
Cornus sanguinea 270
CORDIA 323
dichotoma 323
*Myxa* 323
Sebestena 325
CORYPHA 431, 433, 443
elata 434, 437, 438
Taliera 434, 436, 438
umbraculifera 434
COUROUPITA 257
guianensis 257
CRATAEVA 15
lophosperma 17
*Marmelos* 93
Nurvala 17
*religiosa* 15
Roxburghii 15, 17, 95
*unilocularis* 15
*Vallanga* 90
CRATOXYLON 28
cochinchinense 28
*formosum* 28
CRESCENTIA 347
Cujete 348
CROTON 373
oblongifolius 373, 374
sparsiflorus 373
Tiglium 373, 375
Cryptostegia grandiflora 318
Cupressus sempervirens 474
*Cupania canescens* 119
CYCADACEAE 481
CYCAS 481
circinalis 481
revoluta 481
Rumphii 431, 481
Cynoglossum 323
CYNOMETRA 200
cauliflora 200
polyandra 201

DALBERGIA 152
*frondosa* 155
lanceolaria 155
latifolia 154
Sissoo 152
Datura 320, 328
DELONIX 170
regia 170, 172, 174, 262, 342
DENDROCALAMUS 472
giganteus 473
strictus 473
DILLENIA 1
indica 1
pentagyna 1
*speciosa* 1
DILLENIACEAE 1
DIOSPYROS 293
Chloroxylon 296
cordifolia 293
discolor 298
Ebenum 293
*embryopteris* 294
Kaki 293
montana 293
*montana* 293
peregrina 294
Dipterocarpus 363
DOLICHANDRONE 336, 338, 340
*Rheedii* 337

spathacea . . . . . . . 337
Dombeya . . . . . . . . . 47
Dryobalanops Camphora . . 363
Duranta Plumieri . . . . . 349
*Dypsis madagascariensis* . . 460

EBENACEAE . . . . . . . . . 293
EHRETIA . . . . . . . . . 326
*acuminata* . . . . . . . 326
laevis . . . . . . . . 326
serrata . . . . . . . . 326
ELAEIS . . . . . . . . . 446
guineensis . . . . . . . 446
ELAEODENDRON . . . . . . . 112
glaucum . . . . . . . . 112
EMBLICA . . . . . . . . . 385
officinalis . . . . . . . 385
*Embryopteris glutinifera* . . 294
ENTEROLOBIUM . . . . . . . 224
Saman . . . . . . . . . 224
*Epicarpurus orientalis* . . . 394
ERIOBOTRYA . . . . . . . . 226
japonica . . . . . . . . 226
*Eriodendron anfructuosum* . 41
,, *pentandrum* . 41
ERVATAMIA . . . . . . . . 306
*coronaria* . . . . . . . 306
dichotoma . . . . . . . 306
divaricata . . . . . . . 306
ERYTHRINA . . . . . . . . 157
Crista-galli . . . . . . 157
indica . . 157, 159, 459
ovalifolia . . . . . . . 158
Parcelli . . . . . . . . 157
*variegata* . . . . . . . 157
ERYTHROPSIS . . . . . . . 52
colorata . . . . . . . . 52
EUCALYPTUS . . . . . . . . 246
citriodora . . . . . . . 246
globulus . . . . . . . . 246
robusta . . . . . . . . 246
EUGENIA . . . . . . . . . 238
alba . . . . . . . . . 239
*Jambos* . . . . . . . . 238
*Jambolana* . . . . . . . 242
*javanica* . . . . . . . 239
*malaccensis* . . . . . . 241
Euonymus europaeus . . . . 112
EUPHORBIA . . . . . . . . 366
Antiquorum . . . . . . . 370
*ligularia* . . . . . . . 369
neriifolia . . . . . . . 369
*neriifolia* . . . . . . . 368
Nivulia . . . . . 368, 370
pulcherrima . . . . . . 366
Tirucalli . . . . . . . 366
EUPHORBIACEAE . . . . 366, 407
EUPHORIA . . . . . . . . . 122
Longana . . . . . . . . 122
EUTERPE . . . . . . . . . 465
EXCAECARIA . . . . . . . . 381
Agallocha . . . . . . . 382
bicolor . . . . . . . . 381
*sebifera* . . . . . . . 380

FERONIA . . . . . . . . . 90
*Elephantum* . . . . 1, 90
Limonia . . . . . . . . 90
FICUS . . . . . . . . . . 403
auriculata . . . . . . . 417
bengalensis . . . . 411, 413
*Benjamina* . . . . . . . 404
Carica . . . . . . . . 403
comosa . . . . . . . . 404
*cordifolia* . . . . . . . 409
elastica . . . . . . . . 406
glomerata . . . . . . . 419
hispida . . . . . . . . 416
*indica* . . . . . . . . 413
infectoria . . . . . . . 407
*Krishnae* . . . . . . . 416
*macrophylla* . . . . . . 417
*nitida* . . . . . . . . 405
*oppositifolia* . . . . . . 416
pumila . . . . . . . . 403
religiosa . . . . . 409, 410
retusa . . . . . . 404, 405
*Roxburghii* . . . . . . 417
Rumphii . . . . . . . . 409
FILICIUM . . . . . . . . . 116
decipiens . . . . . . . 117
*Firmiana colorata* . . . . . 52
FLACOURTIA . . . . . . . . 21
*cataphracta* . . . . . . 22
indica . . . . . . . . 23
inermis . . . . . . . . 21
Jangomas . . . . . . . 22
Ramontchi . . . . . . . 21
*sepiaria* . . . . . . . 23
FLACOURTIACEA . . 18, 21, 265
FORTUNELLA . . . . . . . . 78
crassifolia . . . . . . . 78

japonica . . . . . . . 78
Margarita . . . . . . 78
Fraxinus excelsior . . 103, 299

*Galedupa indica* . . . . . . 149
GARCINIA . . . . . . . . 29
Cowa . . . . . . . 30
Mangostana . . . . . 29

GARDENIA . . . . . . . 279
campanulata . . . . . 279
florida . . 279, 280, 307
Fortunei . . . . . . 281
gummifera . . . . . . 279
*jasminoides* . . . . . . 280
latifolia . . . . . . . 279
lucida . . . . . . . 279
*radicans* . . . . . . . 280
turgida . . . . . . . 279
Veitchii . . . . . . . 281
GARUGA . . . . . . . . 99
pinnata . . . . . . . 99
GELONIUM . . . . . . . . 379
*fasciculatum* . . . . . 379
multiflorum . . . . . 379
Geraniaceae . . . . . . 69
GLIRICIDIA . . . . . . . 146
maculata . . . . . . 146
Glycosmis arborea . . . . 73
GMELINA . . . . . . . . 352
arborea . . . . . 353, 376

Gossypium . . . . . . . 34
*Gossypium Demonum* . . . 61
GRAMINEAE . . . . . . . 467
GREVILLEA . . . . . . . 364
robusta . . . . . . . 365
GREWIA . . . . . . . . 64
*asiatica* . . . . . . . 64
*didyma* . . . . . . . 65
*disperma* . . . . . . 65
Glabra . . . . . . . 65
*laevigata* . . . . . . . 65
multiflora . . . . . . 64
subinaequalis . . . . . 64

*Guatteria longifolia* . . . . 19
GUAZUMA . . . . . . . 60
tomentosa . . . . . . 60
GUSTAVIA . . . . . . . . 256
augusta . . . . . . . 256
insignis . . . . . . . 256
GUTTIFERAE . . . . . . . . 29

HAEMATOXYLON . . . . . 185
Campechianum . . . . 185
Hamelia . . . . . . . . 272
Hamiltonia . . . . . . . 272
Heliotropium indicum . . . 323
*Hemigyrosa canescens* . . . 119
HERITIERA . . . . . . . 53
Fomes . . . . . 54, 55
littoralis . . . . . . 53
HETEROPHRAGMA . . . . . 340
adenophyllum . . . . 340
Hevea brasiliensis . . . . . 407
HIBISCUS . . . . . . . . 35
esculentus . . . . . . 35
mutabilis . . . . . . 37
populneus . . . . . . 39
Rosa-chinensis . . . . 35
Sabdariffa . . . . . . 35
schizopetalus . . . . . 35
syriacus . . . . . . . 35
tiliaceus . . . . . . . 35
*tortuosus* . . . . . . . 35
HOLARRHENA . . . . . . 308
antidysenterica . 308, 314
Hoya . . . . . . . . . 318
*Hyophorbe indica* . . . . . 459
*Hyperanthera Moringa* . . 137
HYPERICACEAE . . . . . . 28
Hypericum . . . . . . . 28

*Inga dulcis* . . . . . . . 222
IXORA . . . . . . . . . 282
coccinea . . . . . . 282
parviflora . . . . . . 282
undulata . . . . . . 282

JACARANDA . . . . . . . . 341
filicifolia . . . . . . . 343
*mimosifolia* . . . . . . 341
ovalifolia . 341, 343, 344
JACQUINEA . . . . . . . . 285
ruscifolia . . . . . . 285
Jambosa . . . . . . . . . 238
*Jambosa vulgaris* . . . . . 238
Jasminum pubescens . . . . 299
Jasminum sambac . . . . . 299
JATROPHA . . . . . . . . 372
Curcas . . . . . . . . 372
multifida . . . . . . . 372
*Jonesia Asoca* . . . . . . 178
Juniperus . . . . . . . . 474

*Kentia Macarthuri* . . . . . 461
KIGELIA . . . . . . . . . 346
  pinnata . . . . . . 346
KLEINHOVIA . . . . . . . 55
  Hospita . . . . . . . 55
Kopsia Fruticosa . . . . . 302
Kydia calycina . . . . . . 34

Laburnum vulgare . . . . . 189
LAGERSTROEMIA . . . . . 260
  indica . . . . . . . 260
  *Flos-Reginae* . . 171, 260
  Lancasteri . . . . . . 260
  *Reginae* . . . . . . 260
  speciosa . . . . . 260, 262
  Thorellii . . . . . . 262
LANNEA . . . . . . . . 129
  grandis . . . . . . . 129
Lantana Camara . . . . . 349
  ,, indica . . . . . . 349
Lathyrus odoratus . . . . . 141
LAURACEAE . . . . . . . 358
*Laurus Cassia* . . . . . . 362
Laurus nobilis . . . . . . 358
LAWSONIA . . . . . . . . 263
  *alba* . . . . . . . . 263
  inermis . . . . . . . 263
LECYTHIDACEAE . . . . . . 250
Lecythis Zabucajo . . . . . 250
Leguminosa . . . . . . 205
LEGUMINOSAE . . . . . . 140
LEPISANTHES . . . . . . . 119
  tetraphylla . . . . . . 119
LEUCENA . . . . . . . . . 207
  glauca . . . . . . . . 207
*Licania pyrifolia* . . . . . . 226
Ligustrum . . . . . . . 264
*Limonia monophylla* . . . . 73
Lippia citriodora . . . . . 246
  ,, nodiflora . . . . . 349
*Liriodendron grandiflorum* . 4
LITCHI . . . . . . . . . 124
  chinensis . . . . . . 124
LITSAEA . . . . . . . . . 359
  Chinensis . . . . . . 359
  monopetala . . . . . 360
  *polyantha* . . . . . 360
  *sebifera* . . . . . . 359
LIVISTONA . . . . . . . . 439
  chinensis . . . . . . 439
  *mauritiana* . . . . . . 439
  rotundifolia . . . . . 440
LOGANIACEAE . . . . . . 321
Lycopersicum esculentum . 328
LYTHRACEAE . . . . . . . 259
Lythrum salicaria . . . . . 259

MADHUKA . . . . . . . . 291
  latifolia . . . . . . . 291
  longifolia . . . . . . 292
MAGNOLIA . . . . . . . . 3
MAGNOLIACEAE . . . . . . 3
  grandiflora . . . . . . 3
  pterocarpa . . . . . . 4
  *sphenocarpa* . . . . . 4
Mallotus philippinensis 266, 366
Mallotus repandus . . . . 366
Malva . . . . . . . . . 35
MALVACEAE . . . . . . . 34
Malvaviscus Canzottii . . . 34
MANGIFERA . . . . . . . 134
  indica . . . . . . . . 134
Markhamia . . . . . . . 331
MELALEUCA . . . . . 247, 249
  leucadendron . . . . . 247
MELIA . . . . . . . . . . 103
  *Azadirachta* . . . 101, 103
  Azedarach . . . . . . 104
MELIACEAE . . . . . . . . 101
*Mespilus japonica* . . . . 226
Metroxylon Sagu . . . . . . 456
MICHELIA . . . . . . . . . 5
  *aurantiaca* . . . . . . 5
  Champaca . . . . . . 5
*Micraelus Raeperianus* . . . 390
MILLINGTONIA . . . . . . 333
  hortensis . . . . . . 333
MILLETTIA . . . . . . . . 145
  ovalifolia . . . . . . 145
Mimosa . . . . 205, 207, 342
*Mimosa arabica* . . . . . 212
  ,, *dulcis* . . . . . . 222
  ,, *elata* . . . . . . 217
  ,, *Farnesiana* . . . . 214
  ,, *lucida* . . . . . . 216
Mimosa pudica . . . . . . 205
  ,, rubicaulis . . . . 205
*Mimosa Saman* . . . . . 224
  ,, *Sirissa* . . . . . . 219
  ,, *Suma* . . . . . . 211
MIMOSEAE . . . . . 140, 205
MIMUSOPS . . . . . . . . 288

- Elengi 288
- *Molinaea canescens* 119
- Moquilea pyrifolia 226
- MORACEAE 392, 394
- MORINDA 276
  - *bracteata* 276
  - citrifolia 276, 278
  - tinctoria 276
- MORINGA 137
  - aptera 139
  - oleifera 137
  - pterygosperma 137
- MORINGACEAE 137
- MORUS 396
  - acedosa 397, 398
  - alba 396
  - *indica* 397
  - laevigata 396
  - nigra 396, 398
- MUNTINGIA 66
  - Calabura 66
- MURRAYA 73
  - *Exotica* 73
  - koenigii 74
  - paniculata 73
- MUSA 422
  - Cavendishii 423
  - paradisiaca 423
  - *Sapientum* 423, 424
  - textilis 423
- MUSACEAE 422
- Mussaenda 272
- Myosotis 323
- Myroxylon Pereirae 141
- MYRSYNACEAE 283
- Myrsyne 283
- MYRTACEAE 237, 250
- Myrtus communis 238

- *Nageia Putranjiva* 387
- NAUCLEA 273, 275
  - *Cadamba* 273
  - orientalis 275
- *Nephelium Litchi* 124
- ,, *Longana* 122
- Nerium odorum 301
- *Nerium coccineum* 315
- ,, *tinctorum* 313
- Nicotiana plumbaginifolia 328
- NYCTANTHES 299
  - Arbor-tristis 299

- OCHNA 97
  - squarrosa 97
- OCHNACEAE 97
- OCHROCARPUS 31
  - longifolius 31
- *Odina Wodier* 129
- Olea europaea 299
- OLEACEAE 299
- *Oreodoxa oleracea* 464
- ,, *regia* 463
- OROXYLON 331
  - indicum 331
- Oxalis Acetosella 69
- ,, corniculata 69
- OXALIDACEAE 69

- PALMAE 430
- PANDANACEAE 428
- PANDANUS 428
  - *fascicularis* 428
  - foetidus 428
  - *odoratissimus* 428
  - tectorius 428
- PAPILIONACEAE 140, 141
- PARKINSONIA 175
  - aculeata 175
- PARMENTIERA 344
  - cerifera 344
- Passifloraceae 267
- Pelargonium 69
- PELTOPHORUM 167
  - brasiliense 169
  - *ferrugineum* 167
  - inerme 167, 171, 262
- *Pentaptera Arjuna* 171, 234
- Pergularia minor 318
- Persea gratissima 358
- Petunia nyctaginiflora 328
- PHOENIX 431
  - dactylifera 431
  - sylvestris 431, 444, 450
- *Photinia japonica* 226
- Phyllanthus 383, 385
- *Phyllanthus distichus* 383
- ,, *Emblica* 385
- ,, *longifolius* 383
- Physalis minima 328
- ,, peruviana 328
- PINUS 477
  - longifolia 477

Piper Betle 458
PISCIDIA 147
  Erythrina 147
PITHECOLOBIUM 222, 224
  dulce 92, 222
  *Saman* 224

PLUMERIA 302, 303
  *acuminata* 304
  *acutifolia* 304
  alba 304
  bicolor 304
  rubra 304
  tuberculata 304
PODOCARPUS 479
  *chinensis* 480
  macrophylla 480
Poinciana pulcherrima 165
*Poinciana regia* 170

POLYALTHIA 7
  cerasoides 8
  longifolia 9
  suberosa 7
PONGAMIA 149
  *glabra* 149
  pinnata 149
PROTEACEAE 364
Prunus persica 226
PSIDIUM 244
  Guayava 244
  *pomiferum* 244
  *pyriferum* 244
PTEROCARPUS 151
  dalbergioides 151
  indicus 151
  macrocarpus 151

PTEROSPERMUM 56
  acerifolium 56, 57
  Heyneanum 56
  lanceaefolium 59
  suberifolium 56
PTERYGOTA 50
  alata 50
PTYCHOSPERMA 461
  Macarthuri 461
Punica granatum 259
Punicaceae 259
PUTRANJIVA 387
  Roxburghii 387

Quisqualis indica 228

RAVENALA 426
  madagascariensis 426
Reseda odorata 264
RHAMNACEAE 113
Rhamnus 113
RICINUS 377
  communis 377
Rondeletia 272
ROSACEAE 226

ROYSTONEA 462
  oleracea 463, 464
  regia 462, 463
Rubia peregrina 272
RUBIACEAE 272, 321
Ruscus aculeatus 285
Ruta graveolens 73
RUTACEAE 73

SALMALIA 42
  malabarica 43, 48
*Samanea Saman* 224
Samyda 265
SAMYDACEAE 265
SAPINDACEAE 116
SAPINDUS 125
  *detergens* 127
  *emarginatus* 126
  laurifolius 126
  Mukorossi 127
  *obovatus* 118
  *trifoliatus* 126

SAPIUM 380
  sebiferum 380
SAPOTACEAE 286
SARACA 178
  indica 178, 181
*Sarcocephalus cordatus* 275
Scabiosa 274
SCHIZOLOBIUM 173
  excelsum 173
SCHLEICHERA 121
  oleosa 121, 161
  *trijuga* 121
Scitamineae 422
*Scytalia Lichi* 124
  ,, *Longan* 122
*Senna arborescens* 199
  ,, *sumatrana* 198
SESBANIA 141
  *aegyptiaca* 143

grandiflora 141
Sesban 143
Simaruba 95
SIMARUBACEAE 95
SOLANACEAE 327
SOLANUM 327, 328
indicum 328
macranthum 329
*maroniense* 329
Melongena 328
nigrum 328
*pubescens* 328
torvum 328
trilobatum 328
tuberosum 328
verbascifolium 328
SPATHODEA 331, 338
campanulata 338
*nilotica* 340
*Rheedii* 337
SPONDIAS 131
*Cytherea* 133
dulcis 133
mangifera 131
*pinnata* 131
*Stenolobium stans* 335
Stephanotis 318
STERCULIA 47, 52
*alata* 50
*colorata* 52
foetida 44, 47
villosa 49
STERCULIACEAE 47
STREBLUS 394
asper 394
STRYCHNOS 321
Nux-vomica 321
Potatorum 321
SWIETENIA 107
macrophylla 107, 109
Mahagoni 107, 109
Syringa vulgaris 299
SYZYGIUM 238
Cumini 242
*Jambolana* 242
Jambos 238, 240
malaccense 241
*Michellii* 238
samarangense 239
uniflora 238

Tabebuia rosea 331
,, spectabilis 331
*Tabernaemontana coronaria* 306
TAMARINDUS 183
indica 183
TAMARIX 25
*aphylla* 27
articulata 27
dioica 25
gallica 25, 27
*indica* 25
orientalis 27
*Troupii* 25
TAMARICACEAE 25
TECOMA 331, 335
capensis 335
*rosea* 331
stans 335
*spectabilis* 331
undulata 335
*Tecomaria capensis* 335
*Tecomella undulata* 335
TERMINALIA 228
Arjuna 228, 234
Belerica 230
Catappa 228
Chebula 232
citrina 233
tomentosa 228
TECTONA 349
grandis 350
Hamiltoniana 351
*Tetranthera laurifolia* 359
,, *monopetala* 366
Theobroma Cacao 47, 61
*Thespesia populnea* 39
THEVETIA 302
*neriifolia* 302
peruviana 302
THRINAX 441
barbadensis 441
THUJA 478
orientalis 478
TILIACEAE 64
TREMA 392
orientalis 393
TREWIA 375
nudiflora 354, 375
*Trophis aspera* 394

ULMACEAE 392, 394

Ulmus . . . . . . . . 392
Urticaceae . . . . 392, 394
*Uvaria cerasoides* . . . . . 11
,, *odorata* . . . . . . 11
,, *suberosa* . . . . . 11

VACHELLIA . . . . . . . . 214
Farnesiana . . 213, 214
Vallaris Heynei . . . . . 302
Verbena officinalis . . . 349
VERBENACEAE . . . . . 349
Vinca rosea . . . . . . . 302
VITEX . . . . . . . . . . 354
Agnus-castus . . . . . 354
negundo . 355, 356, 357
trifolia . . . . . . . 356
Voacanga grandifolia . . . 302

WRIGHTIA . . . . . 310, 313
coccinea . . . 314, 315
tinctoria . . . 313, 316
tomentosa . . . . . . 316

Zingiber officinale . . . . 422
ZIZIPHUS . . . . . . . . 113
Jujuba . . . . . . . 114
Oenoplia . . . 114, 116
vulgaris . . . . . . . 114

---

Printed by S. N. Guha Ray, B.A., at
Sree Saraswaty Press Limited,
32, Upper Circular Road, Calcutta.